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PATENTS FOR INVENTIONS.

ABRIDGMENTS

OF

Specifications

RELATING TO

ANCHORS.

A.D. 1796–1866.

PRINTED BY ORDER OF THE COMMISSIONERS OF PATENTS.

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4

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will be found in chronological order in the "Chronological "and Descriptive Index" (*see* List of Works at the end of this book). It is intended, however, to publish these Abridgments in classes as soon as the Abridgments of all the Specifications from the earliest period to the end of 1866 have appeared in a classified form. Until that takes place, the reader (by the aid of the Subject-matter Index for each year) can continue his examination of the Abridgments relating to the subject of his search in the Chronological and Descriptive Index.

The present series is devoted to improvements in the shape and manufacture of anchors. In deciding on the limits within which it should be comprised, it has seemed best to omit all inventions but those which have reference strictly to anchors. The various capstans, windlasses, &c., which are used for weighing the anchor will be found described in the series of Abridgments relating to "Raising, "Lowering, and Weighing." For chain cables, reference must be made to a series now in preparation under the title "Chains and Chain Cables." Hempen cables in like manner will be dealt with in a series devoted to rope-making.

It should be added that improvements in the treatment and preparation of iron for anchors, where such improvements have related to iron manufacture generally, and not specially to the construction of anchors, have not been included, even in those cases in which anchors are incidentally mentioned. On the other hand, the series does contain those inventions for casting, forging, &c., of which anchors are the sole or the principal subject.

B. WOODCROFT.

September, 1874.

TECHNICAL TERMS.

[It is hoped that the following list of some of the principal technical terms used in connection with this subject may prove useful. Only those are given which are directly connected with the contents of the series, and in the sense in which they are applied to the subject in hand. The Abridgments are as far as possible drawn up in consonance with the list, which has been prepared from the best authorities on nautical technology, but as in some cases the inventor has used terms in a different sense from that given below, it has occasionally seemed advisable in the corresponding Abridgment to follow his vocabulary instead of that which it is believed is more generally accepted. A few of the terms given below do not occur in the Abridgments or in the original Specifications; these have been added for the sake of completeness.]

Arms. The curved cross-pieces of the anchor which serve to grapple and hold in the ground. They are often, but not quite correctly, termed *flukes*, the latter being the head plates at the ends of the arms.

Backing an anchor. Laying out a second anchor with its cable attached to the first.

Bill. The extreme point of the fluke. See **Fluke.** Also called **Point** or **Pee.**

Bower-anchors. Those in the bows and in constant use. The best bower is on the starboard bow, the small bower on the port.

Cant. To turn the anchor over into such a position that the flukes can take the ground.

Crown. The part of the anchor at the junction of the arms and shank.

Crown-piece. The portion of metal afterwards forming the crown when welded to the arms and shank. Also a piece sometimes swivelled in the jaws of the shank of an oscillating anchor.

Fluke. The broad plate at the end of each arm of an anchor. The term is also incorrectly but frequently applied to the *arm* itself. The flukes are also incorrectly termed *palms*. See **Arm** and **Palm**.

Grapnel, Grapling, or Grappling Anchor. A small anchor for boats, generally having a ring at one end and four palmed claws at the other. Grappling irons are of similar shape with barbed hooks.

Head. The part of the anchor formed by the arms and crown.

Horn. See **Toggle**.

Kedge. A small anchor used for warping a ship in harbour, &c., also used to keep a ship clear from her bower anchor while riding.

List. See **Cant**.

Mooring Block. A heavy anchor, of any suitable shape, intended to hold a buoy for mooring purposes, and not meant to be moved. Used in harbours, &c., not on shipboard.

Oscillating-anchor. An anchor in which the arms are pivotted to the shank.

Palm. The inside of the fluke. Sometimes incorrectly used for the fluke itself.

Pee. *See* **Bill**.

Portable Anchor. One which can be taken to pieces for stowage.

Shackle. An iron loop moving on a pin, used instead of a ring to the anchor shank. It is often known as the "Jews-" harp shackle" from its shape.

Shaft. See **Shank**.

Shank. The main shaft or stem of the anchor to which at one end the stock is fixed, at the other the arms.

Sheet-anchor. Besides the two bower anchors there are two others, one at either chest-tree abaft the fore-rigging. One is styled the sheet (being the largest and strongest anchor in the ship), the other the spare anchor.

Solid Anchor. One with the arms, &c., fixed.

Spare-anchor. An additional anchor, the size of the bower. See **Sheet-anchor**.

Spur. See **Toggle**.

Square. The part of the shank to which the stock *is* fitted.

Stock. The cross-bar fixed across the shank of an anchor, at right angles to the arms, so as to cant the anchor and cause the flukes to take the ground.

Stream-anchor. An anchor larger than the kedge, but much smaller than the bowers. Used for various purposes.

Toggle. A short projection fixed on the outside of the arms of an oscillating anchor so that by catching in the ground it may serve to open out the arm and cause it to take the ground. Also called *horn* or *spur*. The name is also applied to a short cross-bar fitted on the arms of such anchors, which by taking against the throat of the fork in which the arms are pivotted, serves to limit their play.

INTRODUCTION.

The original idea of the anchor was merely a weight or heavy stone. Probably even the smallest and rudest vessels in which the earliest navigators tried the sea were supplied with such make-shift anchors as these. It will be remembered that it was long the practice among the classical nations of antiquity to draw up their vessels on the beach. Thus were the ships treated who carried the warriors of Greece against Ilium, and long after this we hear of the *machinæ*, or windlasses, which were employed to draw up and down the beach not only small boats but vessels of a considerable burden. Homer however does speak of εὐναὶ, *sleepers*, large stones carried on board ship and used as anchors.* That some more convenient and reliable arrangement than this was soon invented, we may imagine, though it is impossible to say at what period the anchor as we now know it was first made. The legendary author of the instrument was Anacharsis, a Scythian philosopher, about 500 B.C., but Pliny † says that the inventor was Eupalamus, and that Anacharsis only improved it. It is said that the early anchors had only a single arm, and that the second arm was afterwards added. They were then called διπλῆ, ἀμφίβολος, ἀμφίστομος, *bidens* (double-toothed); the one-armed anchor was called ἑτερόστομος (with the edge on one side.) So far as can be judged from representations on coins, &c., the Greek anchors had no stock, nor does there seem any means of deciding when this important addition was made to the anchor. To a thoroughly mechanical age like ours it seems wonderful how long nations of the ancient civilisations waited for a simple mechanical arrangement such as this, but apparently all the ideas of these people ran in so totally different a groove to our own that the attention needful to develop mechanism of the most obvious sort was absent, even if—and of this we know nothing—the special intelligence required did really exist.

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* See Il. i. 436; xiv. 77; Od. ix. 137; xv. 498.

† See Nat. Hist. 57.

When the science of navigation was more fully developed, and the equipment of ships grew more elaborate, it was not uncommon for a ship to have as many as eight anchors.* Readers of the Acts of the Apostles will remember that the ship in which St. Paul was shipwrecked had four.† The last anchor was called ἱερά, *sacra* (sacred), hence *sacram solvere* (to cast the "sacred" anchor) to try one's last hope.

In actual shape the anchor has undergone but little change during all the hundreds of years it has been in use, but in the manner of its manufacture many and great improvements have been introduced. Mr. Pering, a clerk in Portsmouth dockyard, has generally the credit of being the first who introduced any very important alterations.

His invention is described in No. 3726, A.D. 1813, on p. 2, of the present work. Since his time the resources at the command of the anchor-smith provided by the vast mechanical improvements of the past half century have been greatly enlarged, and, as is the case with heavy iron-work generally, the special department of anchor making has received considerable development.

Amongst the most important mechanical appliances in use may be mentioned the steam-hammer, which has replaced the "Hercules" or heavy hammer requiring the united strength of thirty or forty men; and the employment of the "Fan" and "Blower" instead of the ancient bellows. These and the numerous other inventions familiar to all acquainted with heavy forging work have made an entire change in the methods of anchor manufacture during the period covered by the inventions described in the following pages.

At the two great exhibitions which serve as landmarks to mark the progress of the industrial arts and sciences there were some, not a great many, anchors exhibited. From the fact that the attention of those interested in nautical matters was drawn to the examples of anchors shown at the Exhibition of 1851, results of some importance arose. A committee was appointed to examine and test, more accurately than had yet been done, the various rival systems of anchor makers. This committee consisted of five shipowners of London, Glasgow, and Liverpool, with five Lords of the Admiralty. Anchors by the following makers were submitted in competition:—1. Admiralty; 2, Aylen (an improved Admiralty anchor); 3, Honiball (or Porter's); 4, Isaacs (United States); 5, Lenox; 6, Mitcheson; 7, Rodger; 8, Trotman (an improved Porter's).

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* *Athenæus*, v. 43.

† Acts xxvii. 29.

The experiments were made on the parade ground of Sheerness Dockyard, on the beach at Garrison Point, at Blackstakes in the River Medway, and at the Nore. In 1853 the committee sent in a report, of which the following tabular estimates give the main points.

TABLE I.

SHOWING the relative order in which the several ANCHORS stand with regard to each of the properties essential to a good anchor; the names arranged alphabetically.

ANCHORS.	Strength computed from first crack.	Holding long and short scope.	Facility of stowing.	Quick holding.	Quick tripping.	Exemption from fouling.	Facility of sweeping.	Facility of transport in boats.	Fishing in a heavy seaway.	Canting.
Admiralty -	4	5	1	2	1	4	1	2	2	2
Aylen - -	7	4	1	2	3	4	1	2	2	5
Honiball -	2	2	3	4	2	1	4	3	5	3
Isaacs - -	1	6	4	5	1	1	4	4	5	1
Lenox -	6	3	2	1	2	3	2	1	3	2
Mitcheson -	Refused this trial.	1	3	1	3	2	3	2	4	4
Rodger -	5	2	1	1	2	4	2	1	1	2
Trotman -	3	1	3	3	4	1	4	3	5	5

TABLE II.

SHOWING estimated numerical values of the several ANCHORS in regard to the properties considered essential to a good anchor.

ANCHORS.	Strength computed from first crack.	Holding long and short scope.	Facility of stowing.	Quick holding.	Quick tripping.	Exemption from fouling.	Facility of sweeping.	Facility of transport in boats.	Fishing in a heavy seaway.	Canting.	Total values.
Proportionate values of the qualities.	15	80	10	15	5	10	5	5	10	5	160
Admiralty	2·07	6·42	1·82	2·01	·89	·65	·95	·65	1·98	·73	18·17
Aylen -	1·89	9·10	1·82	2·01	·45	·65	·95	·65	1·98	·44	19·94
Honiball	2·33	10·69	·91	1·53	·67	1·85	·29	·52	·55	·60	19·94
Isaacs -	2·63	5·	·45	·59	·89	1·85	·29	·26	·55	·81	13·32
Lenox -	1·92	9·56	1·36	2·36	·67	1·11	·71	·87	1·32	·73	20·61
Mitcheson	Refused this trial.	14·10	·91	2·36	·45	1·39	·57	·65	·88	·52	21·83
Rodger -	1·94	10·69	1·82	2·36	·67	·64	·95	·87	2·19	·73	22·36
Trotman	2·22	14·44	·91	1·77	·31	1·85	·29	·52	·55	·44	23·30
Totals -	15·10	80·00	10·00	14·99	5·00	9·99	5·00	4·99	10·00	5·00	159·9

The committee ranked the anchors in the following order, the Admiralty being taken as the standard :—

Trotman -	- 28 per cent.	Better than Admiralty.
Rodger -	- 26 ,,	
Mitcheson -	- 20 ,,	
Lenox -	- 13 ,,	
Honiball -	- 9 ,,	
Aylen -	- 9 ,,	
Admiralty -	- 1 the standard.	
Isaacs -	- 27 per cent. worse than the Admiralty.	

The reports of the juries on the 1862 Exhibition speak with praise of Rodger's and Trotman's anchors, stating that the former may be considered the best of the solid anchors, the latter the best of those constructed in detached parts. A medal was awarded to Mr. Trotman. A medal was also awarded to Mr. C. Martin for the "novel and ingenious form" of his anchor, and one for an anchor weighing 7,793 lbs. forged in the Royal Yard in Horten, Norway, Honourable mention was awarded to some specimens from the Söderfoss Iron Works, Sweden, and lastly, an anchor on the Trotman principle, shown by Heriot Currie, was spoken of as deserving attention.

With regard to the history of recent improvements in the form and manufacture of anchors, it will be found to be set forth with tolerable completeness in the ensuing Abridgments. The information, however, given in the Abridgments may perhaps be usefully supplemented by the following notes, arranged in chronological order. They have not been brought down to a period below that of the Patent Law Amendment Act, 1852, as it may be safely assumed that since that time all inventions of any consequence have been made the subject of a Patent.

A.D.

1808. The silver medal of the Society of Arts was awarded to Capt. H. L. Bale, R.N., for an improved anchor, in which the shoulder on the shank was enlarged and bolted to the stock which was hooped with iron hoops. (See *Trans. Soc. of Arts*, vol. xxvi., p. 170.)

1809. The silver medal of the Society of Arts was awarded to Samuel Hemman, of Chatham Dockyard, for an improved mooring block. This consists of a heavy cast-iron block of a wedge-shaped form with the sharp end of the wedge slightly recurved; this was fixed to a shank and stock of the usual character. (See *Trans. Soc. of Arts*, vol. xxviii., p. 170.)

1818. The gold medal of the Society of Arts was awarded to J. Park, of Portsmouth Dockyard, for a mooring block, consisting of a block of iron of peculiar shape having a tendency to sink into the ground and with shackle attached thereto. (See *Trans. Soc. of Arts*, vol. xxxvi., p. 84.)

1826. W. A. Kentish invented an anchor similar to that patented by Hawkes, in which a supplementary pair of flukes were added in place of the stock. (See *Mechanics' Magazine*, vol. xx., p. 913.)

1829. The silver medal of the Society of Arts was awarded to Lieut. W. Rodger, R.N., for a "make-shift anchor" composed of pig-iron and timber. (See Trans. Soc. *of Arts*, vol. xlvii. p. 94.)

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ANCHORS.

A.D. 1796, February 4.—N° 2086.

STUARD, James.—The anchor described has but one arm. The shank is to be made very short, "that the anchor may be " sure to fall the right way with the fluke downward"; as is also the arm, as shown in the drawing. Both arm and shank are in one piece. The palm is either "of cast iron or a cast- " iron shell filled with lead" as being heavier. The "back of " the palm" may have a section formed of a semi-circle, of two straight lines meeting at an angle, or of two curved lines meeting in a like manner and having their concavities outwards. At the upper part of the shank is a hole for the cable, and beyond is a hole for the stock, which consists of a wrought-iron bolt "covered with cast iron." The hole for the stock is shaped so as to prevent its turning therein. Instead of a second hole for the cable, there may be a shackle "through " which and the shank the stock must pass." Stops on the shank prevent the shackle falling too low. There is also " a small shackle or two plates with a bolt between them" " on the bend of the shank and arm for the buoy rope to be " made fast to, or a long circular bolt passed through the " plates and fastened to each corner of the palm."

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 6 (*new series*), p. 250.]

A.D. 1811, March 7.—N° 3409.

JACKSON, Richard.—Making shanks for anchors, &c.

A number of bars of "feather-edged iron" of suitable taper are arranged about a "solice [solid?] taper core of wrought " iron" round which they fit closely. The whole is held together by hoops. The mass is then forged into a solid body in the usual way. For other purposes than anchor shanks the core and the surrounding bars may be straight instead of tapered.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 19 (*second series*), p. 210.]

A.D. 1813, March 26.—N° 3671.

BRUNTON, Thomas.—"Anchors and windlasses and chain " cables."

The invention, so far as it relates to the present series, relates to a method of joining the arms of anchors to the shank. The arms are made in one piece and the shank in one piece. " The piece intended for the arms is formed into shape, and of " such a thickness or substance in the middle as to allow a " hole to be made through the centre of the solid piece to " receive the thick end of the piece which forms the shank, " and the said hole in the arm piece is made somewhat conical " or bill-mouthed." By this means the repeated heatings required for welding are rendered unnecessary, "only one " heat being necessary to bring the thick end of the shank " and the hole in the arm into perfect contact." "The arms " with their flukes may be of good cast iron."

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 27. (*second series*), p. 196; also vol. 37 (*second series*), p. 105; Webster's Reports, vol. 1, p. 71 (*note*); p. 205 (*note*); and p. 409 (*note*); Webster's Patent Law, pp. 11, 47, 65, 79, and 108; also p. 130, case 73, and p. 131, case 82, and Supplement, pp. 14 and 30; Webster's Letters Patent, pp. 14, 30, and 59; Carpmael's Reports on Patent Cases, vol. 1, pp. 405, 410 and 447; Parliamentary Report 1829 (*Patent Law*), p. 206; Barnewell and Alderson's Reports, vol. 4, p. 541; Billing on Patents, pp. 46, 90, and 107; Holroyd on Patents, pp. 25, 34, and 84; Dowling and Ryland's Reports, vol. 7, p. 103; Patentee's Manual, pp. 29, 48, and 49.]

A.D. 1813, July 23.—N° 3726.

PERING, Richard.—"Making an anchor on new principles."

The improvements consist "first, in continuing the grain of " the iron from the shank into the arms, similar to the shape " of a knee or arm of a tree, whereby the necessity of effecting " a junction at the crown, as at present welded, is superceded. " Secondly, in carrying a piece of iron across the crown from " the centre of each arm, making thereby a perfect truss, which " when welded resembles the form of a truss beam. Thirdly, " in forming both the shank and arms of flat bars, placed so " as to act edgewise on the line of resistance when the anchor " is in the ground. And fourthly, in forming the largest part " of the shank one-third down from the crown, in a line across " from toe to toe of the arms."

[Printed, 10*d*. Drawings. See Repertory of Arts, vol. 31 (*second series*), p. 201; Meeson and Welsby's Reports, vol. 2, p. 873.]

A.D. 1819, December 4.—N° 4420.

RODGER, William.—"Substitute for an anchor, which I " denominate a block anchor."

The anchor is formed of an arrow-head shaped piece to the stem of which is attached a shackle for the cable. To the point of the arrow-head is bolted a block having on each side of it a flat wing. The bills of the arrow-head first enter the ground and the wings lie flat thereon. When the anchor begins to drag, the wings are driven into the ground and so bring it up. There are ribs on the wings to strengthen them, and holes to which may be attached a buoy rope, or the cable of a second anchor used to back the first.

[Printed, 6*d*. Drawing. See London Journal (*Newton's*), vol. 1, p. 267.]

A.D. 1821, September 11.—N° 4589.

HAWKINS, Richard Francis.—The first part of the invention relates to an improved description of anchor, the second to "improvements in the construction of anchors similar to " those now in use."

In the first part, an anchor is described in which the arms are fitted loosely, and allowed a certain amount of play in a direction at right angles to the plane of the shank, so that both flukes may enter the ground at once. The arms are formed in one piece and play loosely in a hole in the shank. The shank is deeply slotted at its lower end in a direction across the hole through which the arms pass. In this slot is a piece called a "crown piece" which is firmly attached to the arms and has in it a square hole in which a toggle piece is fitted. This allows the arms to play in a certain arc on either side of the shank, which is limited by the toggle piece coming against the top of the slot and so preventing the arms from moving further. This toggle piece acts the part of a stock, which is therefore not required for anchors of this description.

In the second part, "the arms of the anchor is made in one " piece or length with a sufficient substance of iron at the " crown to admit of a hole; the crown end of the shank is " formed with a throat and two loops or eyes" "projecting " between which the arms are placed and secured by a strong " bolt which is passed through" the eyes and rivetted. The stock consists of "two pieces of timber or iron which" "fold "down by a hinge or joint on each side of the shank" and "when required for use, are extended and secured in a cap "or case of iron so as to fasten them in their intended position." The stock may be secured by any convenient means. The ends of the stock may be surmounted by knobs to prevent them sticking in the ground.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 42 (*second series*), p. 1; London Journal (*Newton's*), vol. 4, pp. 60 and 215; Engineers' and Mechanics' Encyclopædia, vol. 1, p. 88.]

A.D. 1821, October 18.—N° 4599.

CHRISTOPHERS, John.—"Substitutes for anchors."

Various sorts of anchors are described.

1. The shank is double, formed of two bars meeting at the top and separating below. The arms of the anchor are made in one piece, and the two parts of the shank are fixed to bosses thereon. The flukes are of the usual shape. The stock is of metal and passes through a hole in the top of the shank, or through one in the crown between the flukes. Or a stock of the usual sort may be employed.

2. "Two double or oval shaped palms" are fixed to "two "curved flukes or ribs" connected by a cross-bar so that the whole forms an H. The arms of a double shank as above are fixed to the flukes at the ends of the cross-bar. These arms are "much wider in one direction than the other" and "form "nearly a square" at the end where they join.

3. Instead of arms, a head like a six-pointed "star" is used. The shank has three shafts as above. The head is concave towards the shank; it has a hole in the centre to allow water and sand to run through. There are also holes for attaching buoy ropes.

4. A head like the last described is used, but of a sort of lozenge shape with two opposite angles truncated, so that the shape of the head is hexagonal with four angles nearly right angles and two obtuse. Sliding bars are fitted in slots parallel with the short sides of the head, so that when one of the sharp angles enters the ground, these bars slide down and rest with their ends on the ground, thus preventing the cable getting under the anchor and fouling it. The shank is double, as above.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 42 (*second series*), p. 321; London Journal (*Newton's*), vol. 4, p. 113.]

A.D. 1822, February 12.—N° 4649.

BRUNTON, Thomas.—The stock is placed close to the crown of the anchor instead of at the upper end of the shank. It is held in position by a fixed collar on it on one side of the shank, and a loose collar on the other secured by a wedge. It is supported by braces bolted to a collar on the shank, and fitting over its ends. These are preferably secured to the ends of the stock by having on them oval eyes, which fit over corresponding oval projections on the ends of the stock, so that by turning round the braces and securing their upper ends to the shank, their lower ends are thus prevented from slipping off the stock. The shape of the stock is cylindrical at the middle, tapering at the ends to oval. The shank is double, with cross-pieces connecting its two arms.

[Printed, 8*d*. Drawings. See London Journal (*Newton's*), vol. 6, p. 302.]

A.D. 1822, October 18.—N° 4715.

SOMES, Samuel Francis.—The anchor has only a single fluke with a short straight arm. This is pivotted to an iron frame, and at the end of the arm are cross-pieces, which bear against a part of the frame and so limit the play of the arm upon its pivot. The shape of frame preferred is triangular. The fluke is pivotted on a cross bar close to the apex of the triangle, while chains are fixed on the base and to them the cable is attached. Two other forms also are shown. In one the fluke is pivotted to a bar forming the base of the triangle, and the cable is attached to its apex. In the other a shank and stock as in the ordinary anchor are used, but the shank carries at its lower end a large loop or eye within which the fluke is pivotted as above. Other forms may also be used.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 45 (*second series*), p. 336; London Journal (*Newton's*), vol. 6, p. 127.]

A.D. 1822, November 1.—N° 4720.

PIPER, William.—The object of the invention is to shape the anchors so that "the grain of the metal shall run nearly "straight" "without cressing or curling the fibre." The anchors are made in separate pieces, and can be taken to pieces for stowage. Various shapes are figured and described.

1. The shank is forked, and in the fork a single tumbling fluke is pivotted. A cross bar fixed on the fluke bears against the throat of the fork and limits the play of the fluke. On each side are projecting rods which act as a stock.

2. Two flukes, at right angles to each other, are pivotted as above, and when one enters the ground the other comes against the throat of the fork.

3. There are two tumbling flukes fitted as before except that they are placed one on each side of the shank and outside the fork, there being a cross-piece on the same spindle as the flukes which bears against the throat of the fork.

4. The shank is straight, and the flukes are held in position by a square guard frame on their spindle which bears against the shank. Otherwise this anchor resembles the last described. Instead of the frame, pins on the spindle may be used in a manner not precisely stated. All the parts of the above anchors are to be made in straight pieces, and the holes punched out of the solid. The improvements may be applied to the shank of a broken common anchor, and the flukes of a common anchor may be cut off and altered to form an anchor of the sort described.

[Printed, 8*d*. Drawing. London Journal (*Newton's*), vol. 5, p. 246; Rolls Chapel Reports, 7th Report, p. 124.]

A.D. 1823, November 1.—N° 4856.

HAWKES, George.—The anchor is made in two parts divided down the centre of the shank, one arm and one side of the shank being in one piece, and the other fluke and the other side of the shank in the other piece. A groove is formed in the opposite halves of the shank, and along this a chain may lie which is made fast at either end to a shackle; one of these shackles serves as an attachment for the buoy rope, the other for the cable.

The two parts forming the shank are bent so that when placed together an eye is formed in which the stock is placed, one link of the chain being large enough to allow the stock to pass through. The whole is held together by hoops round the shank which are secured by wedges. Stays fixed to the arms and the shank may be used. The improvements may be applied to anchors having more than two flukes.

The half-anchors may each be used as a one-armed anchor.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 4 (*third series*), p. 257; London Journal (*Newton's*), vol. 9, p. 7; Repertory of Art and Sciences, *vol. 8, p. 17;* Engineers' and Mechanics' Encyclopædia, vol. 1, p. 87.]

A.D. 1828, March 13.—N° 5625.

RODGER, William.—Two sorts of anchors are described, the first with a single arm, the second of the usual shape.

In the first, the shank is composed of two iron plates bolted together with a centre-piece between them of wood. The arm is forked so that it embraces the shank between its two sides which are welded to the plates of the shank. There is also a bolt passing through both sides of the arm, and through the wood. The fluke is made separate and welded to the arm. The arm is attached to the shank a short distance from its end, so that a piece is left projecting. The stock is made also of timber between iron plates. The timber passes between the plates of the shank, and the plates over them. "The front of " the anchor stock and the iron plate is bevelled or sloped in " such a manner as to give the stock a tendency to bury itself " deeper in soft ground" than usual. With the same object a thin iron plate is welded "upon each side of the front end of " the shank." The shackle for the cable is affixed to the upper plate, on the opposite side to the arms. There is also a shackle on the fluke to which may be attached a chain for fishing the anchor.

The second anchor described has its shank, &c. formed as above, but the plates are continued and bent round to form the arms. A curved piece of iron is welded and rivetted to the back of these and an iron strap rivetted over the crown. Hoops are placed round the shank to strengthen it.

[Printed, 10*d*. Drawing. See Repertory of Arts (*third series*), vol. 8, p. 279, and vol. 9, (*third series*), p. 321; London Journal (*Newton's*), vol. 7, (*second series*), p. 29.]

A.D. 1829, August 21.—N° 5836.

RODGER, William.—This invention consists of improvements on No. 5625, A.D. 1828.

The shank is built up of plates of iron with or without an inner core of wood. Two iron plates forming the top and bottom of the shank are bent in such a way as to form part of the arms. At their other ends they are welded together. The interior of the shank is formed of a square wooden beam, with iron plates welded on each of its sides, or the wood may be omitted, and the iron plates alone used. A crown-piece and flukes are welded to the arms, and the arms strengthened by plates of iron welded along them. The shank is hooped and the stock fitted on. The stock is made in the usual way, and has a hole pierced in it through which the end of the shank passes. It is secured by collars on the shank. Instead of a ring, a shackle is fitted to the end of the shank for the cable.

A stock may be fitted to the shank of a common anchor in this way, by forming a shoulder on the shank against which the stock may abut.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 10 (*third series*), p. 12; London Journal (*Newton's*), vol. 9 (*second series*), p. 94; Repertory of Arts and Sciences, vol. 4 (*new series*), p. 231.]

A.D. 1830, October 6.—N° 6004.

PERING, Richard.—This invention consists of improvements on No. 3726, A.D. 1813.

The shank is made of a shape calculated to resist strains applied in the direction in which they generally come, i.e., in the plane of the arms and shank. The section of the shank is lozenge-shaped, having one diameter longer than the other, and having its angles truncated or rounded off. The description of the former invention is given as follows. It consists :—"First, in continuing the grain of the iron from the
" shank into the arms, similar to the shape of a knee or arm
" of a tree, whereby the necessity of effecting a junction at
" the crown, as at present welded, is superseded. Secondly,
" in carrying a piece of iron from the centre of each arm,
" making thereby a perfect truss, which when welded resembles
" the form of a truss beam. Thirdly, in forming both
" the shank and arms of flat bars placed so as to cut edgewise
" on the line of resistance when the anchor is in the ground.
" And fourthly, in forming the largest part of the shank one-
" third down from the crown in a line across from toe to toe
" of the arms."

The improvements are also applicable to anchors of any other description.

[Printed, 10*d*. Drawing. See London Journal (*Newton's*), vol. 3 (*conjoined series*), p. 202; Mechanics' Magazine, vol. 15. p. 206; Repertory of Arts and Sciences, vol. 6 (*new series*), p. 39; Webster's Patent Law, p. 85; also p. 137, case 123; Carpmael's Reports on Patent Cases, vol. 2, p. 234; Adolphus and Ellis's Reports, vol. 4, p. 949; Meeson and Welsby's Reports, vol. 2, p. 873; Billing on Patents, p. 140; Mandamus applied for but not granted.]

A.D. 1833, June 27.—N° 6443.

CHRISTOPHERS, John.—The invention "consists in forming "the shanks of anchors with eyes or openings, the length of "which shall be more than twice the breadth," for the reception of "wooden stocks." The stock is kept in position by two collars round it, one on each side of the shank. One of these collars is fixed, the other is held in its place by pins driven into the stock beside it, so that it can be readily shifted, and the stock removed. The stock may be of any suitable wood, bound with iron at the ends.

[Printed, 6*d*. Drawing. See London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 376.]

A.D. 1833, July 26.—N° 6455.

RODGER, William.—The improvements consist in alterations of the shape of the shanks, arms, and flukes of anchors. The inventor states "as a rule that the length of the arms, measuring from their points to the nearest part of their throats, "shall be to the effective length of the shank; that is, from "the inside of the arms to the centre of the hole for the shackle "bolt, in the ratio of one to three, and that the distance from "point to point, measuring across the shank, shall be equal to "twice the length of the arms; consequently, the distance "from the points of the arms to the middle line of the shank "is equal to their length." If the length of the shank be 1, the "thickness of the crown" would be $\frac{1}{19}$, the "breadth of the shank at the thick end, $\frac{1}{20}$, the "depth of the shank "at the small" $\frac{1}{20}$, the "breadth of the thick part of the "arm" $\frac{1}{21}$, "and so on for every part of the anchor, observing that the breadth is to the depth of the section in "the constant ratio of three to four, excepting in that part "of the shank termed the square, on which the stock is "fitted; and which is formed close to the collar in the ratio of "two to three." "By depth is meant the dimensions of "the shank and arms in the direction of the greatest strain." Variations in these dimensions may be made. The palms are "broader than they are long or deep" and the weight of metal "saved in the palms is added to the shank near the arms." The arms may sometimes be made without palms. The arms are bent "by a certain sweep or radius, the length of which is

" the distance from the point of the palm to the middle of the " crown, and the centre of curvature to be on the middle line " of the shank at the above distance from the lower parts of " the throats."

The anchors may sometimes be made without any palms, and have a chain attached to the crown for fishing them. The arms may "either be 'shut' at the crown in the usual way, or " according to Mr. Pering's plan." In the latter case, the shank may be made "of two flat slabs" bent to form part of the arms also. A crown piece and flukes are then welded on.

[Printed, 1*s*. 2*d*. Drawing. See Repertory of Arts, vol. 3 (*new series*), p. 301; London Journal (*Newton's*), vol. 7 (*conjoined series*), p. 351; Engineers' and Mechanics' Encyclopædia, vol. 1, p. 90; Artizan, vol. 8, p. 207; Practical Mechanics' Journal, vol. 5, p. 166.]

A.D. 1834, April 26.—Nº 6601.

CHRISTOPHERS, John.—This invention consists of improvements on No. 6443, A.D. 1833. In that Specification an anchor was described in which the stock was fitted in an eye in the shank, such eye being about twice as long as it was broad.

According to the present improvement this eye is made elliptical instead of quadrangular, and the stock is made of a corresponding shape.

[Printed, 4*d*. No Drawings. See London Journal (*Newton's*), vol. 16 (*conjoined series*), p. 287.]

A.D. 1836, July 2.—Nº 7140.

MEGGITT, Samuel.—The arms of anchors are made without flukes and are pointed at their ends. The "breadth of the " fluke is transferred by means of an angular piece" "to the " crown." The central part of the arms is broadened out so as to offer a flat resisting surface to the ground. On the outside of the crown a bar is fixed which follows the curve of the arms. This bar is preferably attached to the arms by links. A chain is fitted to a ring sliding thereon, and is connected by a line to the ring of the anchor so that the anchor can be fished thereby.

The shank may be divided into two arms which are fixed to the ends of the stock so that the stock and the two parts of the shank form a triangle.

[Printed, 10*d*. Drawings.]

A.D. 1836, September 15.—N° 7182.

POOLE, Moses.—(*A communication.*)—Anchors and friction rollers.

The first part of the invention consists in applying guards to anchors. A bar is carried across from one fluke to the other on each side of the anchor. Where this bar crosses the shank, it has on it a projection which fits in a hole in the shank. The object is to prevent the cable fouling the flukes.

The second part of the invention relates to an improvement in windlasses.

[Printed, 6*d*. Drawing.]

A.D. 1838, February 8.—N° 7561.

CHARLTON, George.—Anchors, capstans, &c.

The shank of the anchor is made with two hooked projections near the arms. These are formed by welding or otherwise, and their object is to give a hold for the first hook. By this means the inventor is "enabled to have the flukes rounded off, "which is a figure more suitable for good holding than the "flukes now used but which, according to the present mode of "fishing, is requisite." There is also a shackle at the crown for the buoy rope.

[Printed, 1*s*. 2*d*. Drawings. See Repertory of Arts, vol. 10 (*new series*), p. 279.]

A.D. 1838, August 15.—N° 7774.

PORTER, William Henry.—The arms of anchors are formed in one piece, and this is pivotted between cheeks formed on the shank. The object of this is that while one fluke is buried in the ground, the other may rest against the shank and be out of the way of fouling by the cable. Projections may be formed on the shank just where the points of the palms come, so as to serve for guiding the cable over the points. The stock may be iron or wood. There are projections on the outside of the flukes, to "aid in opening out the under arm and fluke as "the anchor is drawn along the ground."

[Printed, 6*d*. Drawing. See Mechanics' Magazine, vol. 57, p. 77, and vol. 62, p. 153; Practical Mechanics' Journal, vol. 5, p. 166; Artizan, vol. 2, p. 110; Engineers' and Architects' Journal, vol. 41, p. 166; also vol. 15, p. 279; Transactions of the Society of Arts, vol. 54, p. 107; Inventor's Advocate, vol. 4, p. 218; Webster's Reports, vol. 2, pp. 195, 196, 199, and 201; Law Journal (Exchequer), vol. 24, p. 11; Jurist, vol. 1 (*new series*), p. 188; Exchequer Reports, vol. 10, p. 538; Law Times, vol. 24, p. 134, and vol. 25, p. 1, extended for six years (See No. 14357); Confirmation applied for but not granted.]

A.D. 1839, January 19.—N° 7944.

DUGDALE, Richard.—(*A communication from Alexander Ricord.*)—Strengthening articles of iron and steel.

The invention consists in "encreasing the security, tenacity, "and strength" of "articles of iron and steel made of an "elongated form" "by making the same of two concentric "pieces, that is to say, of two pieces one within the other, "welded together at the ends." Among other articles, the invention is applicable to anchors. An anchor is figured in which the shank and arms are thus constructed, the flukes being solid. The inner piece may be tubular, but it is preferably solid.

[Printed, 6*d*. Drawing.]

A.D. 1843, March 27.—N° 9680.

BROWN, Sir Samuel.—Breakwaters, lighthouses, floating lights, anchors therefor and other matters.

The anchors may also be used for ships. One is figured as of the usual shape, but the section of the shank forms a +. The anchor "is to be cast in malleable cast iron, and is then "annealed" in the usual manner.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1846, January 17.—N° 11,043.

PRICE, Arthur Wellington.—An anchor is made in two parts, each part being complete in itself and comprising one arm and fluke, half the shank, and half the stock, the two latter being divided longitudinally. By this means each half can be used separately for light work. The two parts are joined by hoops, and there are dowels fixed in one of the halves which fit into holes in the other half. In each half stock there is a dovetail groove, in which the corresponding part of the shank fits.

The claims are for using dowels, and employing the half anchors separately.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 7 (*enlarged series*), p. 327; London Journal (*Newton's*), vol. 28 (*conjoined series*), vol. 28, p. 2540; Patent Journal, vol. 1, p. 152.]

A.D. 1846, May 18.—N° 11,210.

RODGER, William.—Various shapes for the flukes and arms of anchors are shown, but it would be impossible to describe them accurately without the aid of figures.

The arms are to be wedge-shaped in section, and sharper along the front edge.

The palms have their front side "bevilled off each side so as " to present two oblique surfaces to the ground." Also the palms may be bent backwards to obtain a similar result. Old palms may be thus treated. All the flukes shown in the drawing are short and broad with obtuse-angled bills. They vary in shape, some being almost kidney-shaped, others diamond. Palms as above described may be rivetted on any sort of anchor. The palms may be welded "on the back of the blade " instead of their being welded on in front." They may also be formed "'out of the solid' but with the blade in front " instead of being on the back of the palm."

The stock is made "having the front part of it thicker than " the back part" and with a "stock plate" surrounding the shank, which "forms a nut for the shank to fall into" when the anchor is dragged. The stock may be of iron or wood, or wood covered with iron plates, as described in No. 6455, A.D. 1833.

The shank may be made of "bars or slabs" of iron, laid " flatways in the direction of the greatest strain." Near the stock the shank is "square," elsewhere it is "rectangular" in section.

The crown has a hole for the attachment of a buoy chain.

[Printed, 10*d*. Drawing. See Practical Mechanics' Journal, vol. 5, p. 166; Patent Journal, vol. 2, p. 443.]

A.D. 1846, December 23.—N° 11,509.

GOUGY, Pierre Frederick.—Raising sunken vessels, &c.

The only part of the invention relating to this series consists in the employment of what the inventor terms a "solid anchor" for warping off stranded vessels from shoals and sandbanks. The apparatus consists of a framework of two sets of parallel rods; one set is above the other, and the two are joined at one end to the same cross-bar. At the other end they are held a short distance apart by cross-bars, so that the vertical sides are triangular. A row of points called "flukes" is fixed along the lower edge of the broad end of this frame, and along both its edges at this end ropes are bent to rings for a purchase. Weights are attached to the thin end of the frame. No further particulars of the manner of using the apparatus are given.

[Printed, 1*s.* 10*d.* Drawings. Mechanics' Magazine, vol. 50, p. 505; Patent Journal, vol. 3, p. 129.]

A.D. 1847, July 13.—Nº 11,792.

BEAL, William Langley.—

1. The crown and arms of anchors are made with "lateral "ribs" of "angle iron or gunnel iron," extending along their length.

2. A metal stock is made so that it may fold down along the shank when not in use. It has what is generally known as an umbrella joint upon it near the shank, *i.e.*, a hinge covered by a sliding collar. Pins in the collar prevent its slipping when in use.

3. A peculiarly shaped fluke is described. This part "con-"sists in forming the entire breadth and length of each flook "on the outside smooth and even, in a line continued or "coincident with the outer curve of the arm, and inside of "such an angular figure that a transverse section of the flook "shall represent a triangle, the flook constituting a triangular "wedge."

4. The arms of an anchor may be forked so as to be double.

5. The two arms may be formed in one piece, and this pivotted at its centre to the shank so that when one fluke enters the ground, the other rests against the shank. By removing the bolt on which the arms are pivotted, the arms and shank may be separated for stowage.

[Printed, 8*d.* Drawing. See London Journal (*Newton's*), vol. 32 (*conjoined series*), p. 240.]

A.D. 1849, June 5.—Nº 12,640.

FIELD, Osgood.—(*A communication.*)—Guards are attached to various parts of the anchor to prevent the cable fouling it.

A guard stretches across from each fluke to a point on the shank. These are pivotted to the shank, and are connected by a cross-bar, so that when one fluke is in the ground its guard lies along the shank, and the cross-bar raises and extends the guard of the other fluke. Similar guards extend from the ends of the stock to a point on the shank, but these are fixed. A guard formed of a rectangular frame is pivotted to the crown so that it falls over to the side on which the anchor is lying, and prevents the cable getting under the crown.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 15 (*enlarged series*), p, 8; London Journal (*Newton's*), vol. 36 (*conjoined series*), p. 384; Mechanics' Magazine, vol. 51, p. 550; Patent Journal, vol. 8, p. 141.]

A.D. 1850, June 19.—N°.13,136.

GREENWAY, Charles.—Pumps, anchors, and the propulsion of vessels.

The second part of the invention consists in "forming " anchors by cutting or stamping out of sheet metal a series " of parts, each of the form of an anchor, in place of forming " anchors of bar iron, and by piling, welding, and forging." The parts to form the flukes may be cut out with the rest, and turned over to the proper angle, or may be made separate and fixed on. The different parts may be connected together by screws or bolts, so that the anchor can be taken to pieces. This is termed a "portable anchor." In this case it is preferred to alternate plates of zinc between the iron plates; these "will " serve to counteract corosion." To make "solid anchors," the parts are bound together, heated, and forged.

There is a disclaimer appended to this Specification, but it does not refer to any of the improvements above described.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 17 (*enlarged series*), p. 47; London Journal (*Newton's*), vol. 38 (*conjoined series*), p. 34; Mechanics' Magazine, vol. 53, p. 517; Patent Journal, vol. 10, p. 151.]

A.D. 1852, April 20.—N° 14,076.

TROTMAN, John.—" The improvements are chiefly applic- " able to that class of anchors known as 'Porter's anchors,' " and consist, first, of forming or fixing the palm inter- " mediately of the breadth of the arm; secondly, in forming " the horn wider than the arm; and thirdly, in forming or " affixing the palm of that class of anchor known as Porter's " anchor at the back of the arm." When the palms are fixed at the back of the arms, the horns " form part of the palm." It is added that as the palm has before being placed at the back of the arm in ordinary anchors, this part of the invention consists merely in thus applying palms to " those arms of "anchors which move on axes." "The angles which the "faces of the arms and the faces of the palms make to the "shank and to each other may be varied, but it is important "that the angles which the palms make to the shank, and "those made by the arms should be different."

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 20 (*enlarged series*), p. 347; London Journal (*Newton's*), vol. 42 (*conjoined series*), p. 265; Mechanics' Magazine, vol. 57, p. 354; Practical Mechanics' Journal, vol. 5, p. 166.]

A.D. 1852, May 22.—N° 14,130.

ROBERTS, RICHARD.—Ship-building.

One of the improvements mentioned refers to anchors.

The anchor is one with swivelling flukes, of which one takes the ground while the point of the other rests against the shank. The shank is made of a plate of rolled iron bent double, and its upper part is "twisted to stand at right angles with the "lower portion." The stock is fitted in the loop at the end of the shank formed by the bent plate, and the shackle is made fast to the stock on each side of the shank. The sides of the shank are held apart by a cross-stay. The arms are of "two "wrought-iron plates connected together" by "segment "plates," and are pin-jointed to the shank. The horns on the arms are "made angular, and the points of the arms made "to bestride the shank." The ends of the stock are bent to prevent fouling. The shank, instead of being of one plate doubled, may be of "two plates jointed on the top by rivets."

When the anchor is fished, the stock being only connected to the shank by means of the shackle as above, is free to take any position with regard to it.

[Printed, 3*s*. 2*d*. Drawings.]

A.D. 1853, February 9.—N° 14,357.

HONIBALL, MARY, executrix of JAMES HONIBALL, obtained an extension for six years from August 15, 1852, of Letters Patent granted to WILLIAM HENRY PORTER, for his "Im-"provements in anchors," No. 7774, August 15, A.D. 1838.

[For Specification, see original Patent, as above.]

PATENT LAW AMENDMENT ACT, 1852.

1852.

A.D. 1852, October 1.—N° 67.

BROWN, James.—(*Provisional protection only.*)—"Making "ships' or other vessels' anchors."

The following is the entire Specification:—"That they can "be made of angle iron, T-iron, or flat iron, or the three "combined, secured together with either hoops, bolts, rivets, "or nuts, and screws, thereby saving great manual labour; to "be called a portable anchor, that is to say, an anchor capable "of being taken to pieces. And I also claim a peculiar "formation of anchors."

[Printed, 4*d*. No Drawings.]

A.D. 1852, October 25.—N° 515.

MITCHESON, Robert William.—It is stated that this invention consists of improvements on "the anchor provisionally "registered by William Mitcheson and Sons," February 12, 1852, according to the Designs Act, and "completely re-"gistered" December 9, 1853. The faces of the palms are convex, and there is given "to the extremity of the palms of "the anchor an inclination in the reverse direction to the "curve of the arms." In the Provisional Specification it is said that there is "a collar to bind the two parts of the stock "to the shank." "This collar eases the strain on the shackle "bolt and assists the anchor in taking ground."

[Printed, 6*d*. Drawing.]

A.D. 1852, November 12.—N° 721.

BLOOMER, Caleb.—The Specification describes a method of making anchors of which the arms are in one piece and pivotted to the shank.

The arms are formed of two parallel iron bars bent to the required form. Between these the shank is pivotted. Each palm and horn is made solid. The palm is placed in position, and the horn bent up to the proper angle. It is then rivetted, and the point of the palm with the two points of the arm are welded together. "The stock is passed through the shank " and secured by a bolt pin, and a ring is also attached by " a pin to the end of the shank." The anchor is then complete.

[Printed, 8*d*. Drawings.]

A.D. 1852, November 22.—N° 820.

HUNTER, Samuel.—The palms of anchors are made of two plates fixed on the arm and inclining together so that the palm is concave.

The stock is made "of iron plates rivetted and hollow, the " form being convex towards the arms and concave on the " other side." The object of this is to cause the stock to bury itself.

[Printed, 6*d*. Drawing.]

A.D. 1852, November 24.—N° 843.

CASELLI, Henry Richards.—(*Provisional protection only.*) —The invention is stated "to consist in a certain method of " constructing anchors of *angle iron* or of *plate iron*, or of " *angle iron* and *plate iron* combined, and united together by " screw bolts, rivets, or other suitable mode of fastening, so as " either wholly or in a great measure to supersede the necessity " for the extreme heating and forging hitherto employed in " the construction of anchors, and also to obtain increased " strength with a diminished weight of metal."

The above is the whole Specification.

[Printed, 4*d*. No Drawings.]

A.D. 1852, December 9.—N° 1012.

GREENWAY, Charles.—"This invention consists of making " the stem of plates of sheet iron, and such plates are kept at " a distance by wood or by angle or by other iron, and the " flukes are rivitted to the plates of the arms. The plates " constituting the arms are combined by rivits, bolts, or " hoops." Two or more plates are to be used for each part of the anchor.

[Printed, 6*d*. Drawing.]

1853.

A.D. 1853, May 10.—N° 1142.

BROWN, James.—(*Provisional protection only.*)—

1. The "invention is only applicable to anchors, the arms " of which work on an axis, and consists of two projections " from the inside of the arm near to the crown, and being one " on each side of the shank, so that when there is any strain " upon the anchor the upper projection will press down upon " the upper part of the shank near to the crown," " by " which means the under part of the arm will be forced into " the ground."

2. The "invention consists of the arm of the anchor being " in two parts, which also work on an axis in such manner " that each arm forces itself in the ground by the projection " of the arm pressing down against the upper part of the " shank."

[Printed, 6*d*. Drawing.]

A.D. 1853, May 18.—N° 1222.

HASKETT, John.—"Anchors, to be called the 'Ferdinand " 'Martin safety anchor.'"

The anchor is made with a pair of tumbling flukes fixed to a central piece which is pivotted in a fork in the shank. Both flukes take the ground at once, and their movement is controlled by the centre piece catching against the throat of the fork.

There is no stock, and the anchor may be got atrip in the usual way, or by sending down a messenger along the cable, which slips down the shank to the junction of the arms.

[Printed, 8*d*. Drawings.]

A.D. 1853, May 21.—N° 1257.

BETTELEY, Joseph. — The arms of the anchor described are " each of a curved form, and the ends (by which they " are fixed to the shank and to each other), cross each other " and incline and run into the shank, and in this state the " parts are welded together." " The flukes are made each " of two surfaces, meeting together at an angle near the

" middle." On the upper end of the shank a disc is fitted, the shank passing through the disc. "Above the disc is " applied the iron stock, which is in two parts, and put " together by hoops or screw bolts or nuts." The stock is " made in two parts," apparently of two bowed iron plates, meeting at their ends. It "may be fixed by means of sockets " formed to receive the same on the disc," "or by passing a " bolt through."

[Printed, 6*d*. Drawing.]

A.D. 1853, October 1.—N° 2241.

BLOOMER, Caleb.—This invention consists of improvements on No. 721, A.D. 1852. In the above Specification an anchor was described in which the arms are formed of two plates having the shank between them. The present invention refers to a horn and palm for such an anchor. The horn and palm are made separate, and a tongue-piece is affixed to each of them, by means of which they are to be bolted together. A tongue-piece may also be formed on the horn alone, and this rivetted to the palm.

[Printed, 6*d*. Drawing.]

A.D. 1853, October 3.—N° 2253.

DWYER, Michael, and BROWN, James. — The invention applies to anchors, the arms of which work on a pivot. The arms are in one piece, and work in the same plane with the shank. The piece forming the arms broadens out opposite the crown, and has in it a slot in which fits a pin on the shank. By this the movement of the arms is limited, and it is also stated that the fluke entering the ground is driven down by the edge of the slot pressing against the pin.

The shank has jaws between which the arm-piece is pivotted, and the pin in the slot passes through both jaws. The shank may also be doubly forked, and the arm-piece slotted to allow the central jaw of the shank to work within it.

[Printed, 8*d*. Drawings.]

A.D. 1853, October 10.—N° 2314.

MARYON, Robert James.—(*Provisional protection only.*)— The invention relates to "several methods of forming the

" lower arms or flukes of anchors of a concave shape, either " with single or double palms, either for swivel or fixed flukes." " Secondly, for the several methods of constructing the shanks " and stocks or upper arms of anchors, and particularly for " certain means of adjusting and reversing the upper arms or " stocks of anchors." One anchor figured is "on the principle " of the swivel flukes well known in the marine as Porter's " patent," "and which resemblance exists only in the swivel " pin." The flukes appear to be double, one behind the other, and it is said that this "does away with the unpleasent pro- " gection" "in thoes anchors called a horn." The shank is " concaved, as far as may be, also, consistent with strength " from the gaws" "to the collar." Thence it is round for some distance "to admit of the stock nut to travel up and " down the shank, so as to adjust the stock when the anchors " is over the bows of ships for their safety when under weigh, " thereby preventing in case of collission any damage to " either occursion." There are "studs or guides for the nut " to travel up and down the shank so as to turn a quater of a " circle as necessary to bring the stock of anchor in a line " parallel with flukes when not employed in the ground, and " when employed, the reverse way to the flukes." There is also " a rest piece for the inside of palm to take its bearing on." The " flukes and palms" "are made flater on their surfaces towards " their extremities." A "tubular shank" is made oval so as " to take greater strain with lighter metal."

Figures are given of various parts of the stock. There is a nut with "one, two, or more diagonal or curvilinear slots, or " what is commonly known as a screwed nut cut or cast within " its cylinder. This nut is to be "placed secure within" another "cylinder" "being wrought iron, on its outer ex- " tremities are formed arms" which receive "tubular arm " stocks." There are also "swivel stops or balls being so " fastened in the tube as to be free to turn either way, when " by the law or action of gravity they will be undermost and " keep the anchor from listing or canting."

[Printed 8*d*. Drawing.]

A.D. 1853, November 10.—N° 2603.

RODGER, William.—This invention consists of *improvements on No. 11,210, A.D. 1846.* The palms instead of being bevelled, as described in the above Specification, are curved so that they "present concave surfaces obliquely to the line "of traction with an intermediate surface (comparatively "small) at right angles thereto."

The shape of the middle part of the stock, where it meets the shank, is modified, that of the rest being as before. The "front "part" thereof is "somewhat wider than heretofore, both "vertically and laterally," and the front and back are united by "curved instead of straight lines, so that the lower side of "the stock will present to the ground a concave instead of a "plain or flat surface."

[Printed, 8*d*. Drawing.]

A.D. 1853, November 18.—N° 2679.

TAYLOR, William.—The first part of the invention consists in making anchors of suitable metals or alloys and hollow either entirely or in part.

The second part applies to anchors with one arm. A hook swivelling on a bolt is affixed to the shank near the crown and the cable is passed over this hook. When the anchor reaches the bottom, the cable slips off the hook, and the hook turns over and hangs downwards out of the way of fouling by the cable.

[Printed, 8*d*. Drawing.]

1854.

A.D. 1854, January 26.—N° 199.

FIRMIN, George.—The invention consists in forming the shanks and arms "cellular, that is to say, of metal hollowed "out." They may be made solid, and deep grooves be cut along them or built up of plates of various shape, T iron or angle iron. A solid boss is left at the part where the stock crosses the shank, and this boss is drilled out to receive the shank. Another boss is formed at the end for a ring bolt, and the shank is also solid at the end where the arms are fitted on. If these are pivotted to the shank, the latter is let into a slot in the crown and pivotted there. The flukes and "spurs" are formed separately and welded on.

Instead of fixing the stock in a slot in the shank, the stock may be formed with a collar "slotted out so as to fit the plates "of which the shaft is composed."

The anchor is termed the "Tutela anchor."

[Printed, 10*d*. Drawings.]

A.D. 1854, April 6.—N° 795.

BOYD, James Edward.—(*Provisional protection only.*)—The following is the whole Specification.

"This object is to be accomplished by constructing the "anchor in two or more parts, and so uniting them together with "a movable bolt fitting into a recess or chamber loaded with "combustible matter, that the bolt may be suddenly expelled "or removed by the explosion of such combustible matter, "thereby causing the parts to be disunited at their junction, "and releasing the ship from her anchorage. The explosion "of the combustible matter is to be occasioned by electric, "galvanic, magnetic, or other agencies, to be conveyed to the "anchor by means of the ship's cable, or a chain, wire rope, "or other appliance, either attached thereto or seperate and "apart therefrom. Or the dismemberment of the anchor may "be effected without combustible matter by the employment "of mechanical agency. The several parts of the anchor, "although disunited at the junction, are still held together by "means of chains, whereby they are recovered and re-adjusted "as often as required."

[Printed, 4*d*. No Drawings.]

A.D. 1854, May 2.—N° 986.

MARY'ON, Robert James.—The description of the improvements is given at some length, in a Specification of 57 pages. The anchor described is one with flukes swivelling in jaws on the shank, so that one fluke takes the ground while the point of the other rests against the shank. The arms instead of being pointed have a hatchet-shaped edge with two flukes, one on the inside, the other on the outside of the arm. The arms have stops on them which bear against the jaws of the shank. They may work on a pivot in the usual way, or they may have in them a segmental slot, through which are fixed two pins from the jaws of the shank, or they may be left free to move between the jaws, without any pivot, the ends of the jaws being united, so as to form a loop. The horn on the arm, when it is used, is pivotted to the arm, and there is a slot on the arm into which it is stated the horn will fall after it has served to open out the arm. The shank may be formed of a single bar bent in the middle and the ends brought together so as to form a double bar. The arms are pivotted at the end where the double of the bar is, and there is a cross-piece fitted between the two bars on which the point of the fluke rests. The opposite end is slotted to receive a stock. The stock may be formed with "collapsing" arms, pivotted to a centre piece fitted to the shank, and held in position by short chains attached to the arms of the stock and to the cable, so that when strain is thrown on the cable the arms are held out in a horizontal position. They are prevented from passing beyond this position by the joint which attaches them to the shank being a rule-joint. Or the stock may be made to slide in a slot in the shank and may be drawn into position and held there by a chain attached to the cable passing through the shackle and fixed to a bolt on the stock.

The inventor uses a traveller to get the anchor atrip, and has a shackle affixed to the crown for the same purpose.

[Printed, 2*s*. 8*d*. Drawings.]

A.D. 1854, July 13.—N° 1543.

CHAUVET, John Baptist.—The arms are made to swivel so that both flukes may enter the ground at once. They are formed in one piece, and the shank is formed of two paralled pieces bolted together and shaped so that when placed together they leave an aperture in which the arm-piece is fitted. In this aperture a stop is fitted which limits the play of the flukes in either direction. The parts are fitted together by placing the halves of the shank in position over the arm-piece, which is formed with a suitable collar to receive them, and bolting the halves together. The parts are to be greased before being put together, and a hole is pierced through the part of the shank over the arms by which grease may be applied.

The anchor has no stock.

It is got atrip by means of a buoy rope fastened to the crown, or by sending down a messenger which fits on a neck formed for the purpose on the shank near the arms.

[Printed, 10d. Drawing.]

A.D. 1854, December 14.—N° 2631.

RUSTON, Richard.—(*Provisional protection only.*)—The whole Specification is as follows:—

"This invention consists in giving to an anchor an elasticity " in the direction of the length of the shank. For this pur" pose the shank of an anchor is made of two parts, one sliding " within the other. The end of one part is formed with or " fixed to the arms, and the end of the other part is formed " with or fixed to the stock, and a springs or spring are intro" duced into the tubular part in such manner as to tend to " draw the two parts of the shank together, and to resist the " shank being extended in length; hence, when a ship is " riding by such an anchor, in case of sudden stress on the " ship, the spring by its elasticity will allow the shank of the " anchor to become lengthened, and when the ship is relieved " the spring will re-act and bring the parts of the anchor to " their ordinary positions."

[Printed, 4*d*. No Drawings.]

A.D. 1854, December 15.—N° 2640.

CLARK, William.—One object of the invention is to dispense with the horn usual in anchors which have their arms pivotted on the shank. This is effected "by jointing the flukes to the shank, " with the joint in a position somewhat concentric with the arms " or flukes; that is to say, the arcs of the flukes may be de" scribed from the joint pin as a centre, or nearly so, which " has the effect of causing the flukes to roll, as it were, on the " ground, and thereby to open out the lower one. To effect " this, the flukes have a piece projecting from the inner arc, in " the direction of the shank, which carries the joint pin; the " shank is shortened in proportion to the length of this piece." " The flukes require to be considerably longer from tip to tip " than the ordinary construction. Instead of forging the joint " piece solid with the flukes, a separate triangular piece may " be used, the joint being at one angle, while the other angles " are fixed to the flukes by pins passing through them."

Another improvement consists in constructing the shank with two joints "one at the end, in the usual manner, where it is " joined to the flukes or arms, and another joint some short " distance up the shank from that point, thus forming a short

" link between the main shank and the flukes; this short link " is so arranged that its upper end projects beyond the joint " some distance, so that it bears upon the palm before any " strain comes on it, and keeps the palm off the shank in order " to enter the ground; but when subject to strain, it does not " so act on the upper palm, which comes down on the shank " as usual, to prevent fouling." The short link may also be made "without being prolonged," and in that case the joint between the link and the arms is constructed so as to limit the play of the link. "A very small horn or projection may be " added to these anchors to render its holding more certain. " These horns may, however, be so formed as to avoid " fouling."

[Printed, 8*d*. Drawing.]

1855.

A.D. 1855, January 6.—N° 39.

SCOTT, JOHN.—The shank of an anchor is formed "of two " plates of iron or other metal, kept apart throughout the " whole or a portion only of their length by means of a " filling piece of wood or other suitable material, or by " means of suitable enlarged portions of the plates them" selves. The shank is united to the arms either by a " forelocked pin or pins, or by clinched bolts or by screw " bolts, according as the arms are intended to be moveable " about a centre or otherwise. When the filling piece is used, " a metal collar is made to embrace the two plates and the " filling piece, which forms the shank, for the purpose of " combining them more effectually at their junction with the " arms, which may be made flat and of an uniform thickness, " or of any other desired form."

[Printed, 6*d*. Drawing.]

A.D. 1855, January 12.—N° 82.

HODGSON, JOSEPH RAY.—"The arms and flukes consist, by " preference, of one forged mass, and in place of having a

" shank made part of or solid with the arms, there is formed " on either side a groove to receive the end of a plate, and " there is also formed a projection where the shank ordinarily " comes, which, by means of a pin or key, admits of the end " of a chain being fixed thereto, and yet allows the same readily " to be detached therefrom when it is desired to stow away " the anchor."

" The shank consists of two plates, the section of which may " be varied. It is, however, preferred to have them convex " outside and flat or plain on the inner surfaces. One end " of each of these plates is placed in the groove formed on " either side of the arms to receive it, and the plates are " retained in their places by a pin passed through them and " through the crown of the anchor. Through the other end of " these plates the stock is passed, and is fixed or keyed securely " thereto; hence the parts can readily be separated when not " required for use." "The stock also passes through the last " link of the internal chain, before mentioned, and such link " has fixed thereto a shackle, to which the cable is attached " when the parts of the anchor are put together for use."

[Printed, 6*d*. Drawing.]

A.D. 1855, March 5.—N° 490.

DE GUINON, Richard Van Valkenburgh. — "Moveable extension flukes" or "scoops" are fitted on to an anchor of the ordinary construction for use on muddy or sandy bottoms. Each fluke fits on to one of the arms and is of such a shape that the two together form a complete spoon or scoop. The fluke has a cap on its end which fits over the joint of the ordinary fluke, and it is cut out to fit close to the shank and under a collar thereon. It is fixed to the arm by eye-bolts on it which pass through slots in the fluke, and there are also braces jointed to the flukes near the edge, and to a collar near the upper end of the shank. The flukes are also connected to each other by bolts, and they may have on them suitable projections which fit against the arms.

To get the anchor atrip, a chain attached to the crown or to one of the flukes is used, by which the "scoop" is emptied of sand, &c.

[Printed, 6*d*. Drawing.]

A.D. 1855, March 29.—N° 702.

JOHNSON, John Henry.—(*A communication from Louis Frederic Francois David.*)—The arms of anchors are made in one piece and swivel in a socket in the shank, so that both flukes take the ground at once. Cheeks are fitted to the arms on each side of the shank, and a crosspiece fitting between these cheeks abuts on the shank on each side, and limits the play of the arms. Or the sides of the cheeks may bear against the end of a pin fixed across the shank for the same purpose. To keep the arms parallel with the shank for stowage a pin may be passed through the cheeks and the shank. There is no stock required. If preferred, one may be used of half the length of the shank. The arms are thicker at the central part where they pass through the shank, and they may be of an oval section at that part.

[Printed, 10*d*. Drawing.]

A.D. 1855, June 13.—N° 1353.

BETTELEY, Joseph.—The arms of anchors are made in one piece, and pivotted to the shank, "as in the form of anchor "known as 'Logan and Porter's.'" The shank is made of two plates of iron kept apart by wood or otherwise, and the arms are pivotted on a pin between these plates. The plates are welded together at their upper ends, and slotted to receive a stock, which is made preferably of two iron bars "connected at their outer ends, yet separated in the middle" by a filling piece driven in after the stock is placed in position. The shank is preferably "hooped together to "receive the point of the flukes," the hoop being so placed as to "form a bearing point for the point of the palm" "when "the anchor is in use." Rings are fixed to the back of the flukes to aid in fishing the anchor. These rings may be "so "formed as to act as the ordinary lugs to cause the anchor to "open."

[Printed, 8*d*. Drawing.]

A.D. 1855, October 17.—N° 2317.

BESSEMER, Henry.—An anchor is described and figured in which the space between the arms and the shank is filled with a web of metal so as to strengthen the arms. The form of the web may be varied, but "the face of the flukes should "project beyond the webs."

Improvements are also described in the method of manufacturing anchors. A mould is made of the proper shape, and into it molten steel or molten scrap iron is poured. The metal is allowed to remain in the mould till it is of a red heat, when it is transferred to an annealing oven; there it is kept at about the same temperature for three or four days, after which it is allowed to cool slowly. If an iron ingot mould is used, it "may be made to open in two or more parts, the joints being "made to fit closely, and the parts secured by iron bolts and "nuts, the bolts passing through flanges formed at those parts "where the different pieces of the mould unite." The interior of the mould is treated in the usual manner for casting steel.

The anchor may be cast "more massive in its proportions "than it is intended to be when finished," and forged "as "evenly as possible" at a red heat, thereby avoiding the necessity for a welding heat.

In forging anchors from an ingot of iron or steel, the ingot is cast roughly into the shape of an anchor, and when the casting is sufficiently solidified it is placed under the hammer, the mass being re-heated as required. The flukes are forged out of the solid; the arms are forged straight and afterwards curved.

[Printed, 8*d*. Drawing.]

A.D. 1855, December 19.—N° 2871.

RUSTON, Richard.—"Anchors and appendages to be used "therewith."

The first part of the invention relates to a method of "giving "elasticity to the shanks of anchors." The shank is formed of a tube, within which is a helical spring coiled round a rod, The spring bears against a shoulder at the bottom of the rod at one end, and against a shoulder formed in the upper part of the tube at the other. The bottom of the tube is closed by a screw plug, and at the top the rod passes through a hole in the shoulder, and has at its upper end a swivel to which the cable is attached. Where the rod passes out of the tube, it is surrounded by an india-rubber washer to keep the interior of the tube water-tight. The stock is slid on to the top of the tube, which is made square to fit a square hole in the stock; it is fixed on by a "cotter or otherwise."

The flukes are fixed to the tube, and when they are engaged in the ground, the cable being affixed to the rod, the spring is compressed by any strain on the cable, and sudden shocks thus prevented.

The rest of the invention refers to the application of a spring to the cable.

[Printed, 6*d*. Drawing.]

1856.

A.D. 1856, April 4.—N° 816.

FISHER, Samuel.—Manufacture of anchors, &c.

In the Provisional Specification the inventor states that the invention consists in manufacturing the various articles enumerated in the title "by casting them in malleable iron, and after- "wards annealing them in a peculiar kind of muffle;" but in the Final Specification the casting of anchors, &c. in malleable iron is disclaimed, as having been the subject of a prior patent by Henry Bessemer, and only the special method of annealing is claimed.

The muffle is formed of two retorts of fire-brick, one "con- "centrically inside the other immediately above the fire-bars; "the outer retort is simply an iron case lined inside with fire- "brick, with a dome-shaped lid, and a flue at the top having "an outlet immediately under this lid communicating with the "stack." The article to be annealed is placed in the inner retort, and this is filled with iron ore; the top of the retort is then "built over in fire-brick." There may be a third retort between the two mentioned, and the space between the two inner retorts filled with sand. The flame passes between the two outer retorts. For a cylindrical muffle the fire-bricks are specially moulded as portions of an arc, "and with a dovetail "or mortice on each end, so that on bedding two bricks "together space is left between their ends;" this space is to be filled with fire-clay, and the muffle thus made can be taken to pieces and re-made as required.

[Printed, 4d. No Drawings.]

A.D. 1856, April 29.—N° 1020.

JOHNSON, John Henry.—(*A communication from Louis Frederic Francois David.*)—Several forms of anchor stocks are figured and described, all of which are constructed so that the stock swivels on a pin in the shank, and may be brought parallel thereto for stowage. The stock has on it a projecting piece by which it is pivotted, so that it may lie close against the shank. It may fit over the shank or be pivotted in a fork thereon. In the first case the stock is formed of two iron plates kept apart by iron rivets or filling pieces of iron or wood. The shackle or ring may be fixed on the stock or on the shank, but if it is on the shank, the rivets, &c. must be far enough apart to allow the ring to pass between the plates forming the stock. To fix the stock in position a second pin through it and the shank, beside the one on which it is pivotted, is used. The ends of the shank may be curved upwards to take the ground on a sandy bottom and act as flukes; for the same purpose the filling pieces at the end may be bevelled off to a sharp edge. When the stock is pivotted in a fork on the shank, it is of "any desired or "suitable section of bars for obtaining strength and lightness "combined." The shackle is figured as working on the pin connecting the stock and shank.

[Printed, 10*d*. Drawing.]

A.D. 1856, May 1.—N° 1038.

HUNTER, Samuel.—The invention applies to anchors with flukes pivotted on a pin joint, and its object is to dispense with the horn or toggle fixed on the back of the fluke to open out the anchor. On the shank, a short distance from the pivotted flukes, is fixed a pair of standing flukes, against which the palms of the pivotted flukes bear, so as to prevent their closing down to the shank. These smaller flukes also are available for taking the ground in the usual way.

[Printed, 6*d*. Drawing.]

A.D. 1856, May 15.—N° 1148.

NORRIS, William, and KING, Robert.—The invention relates to anchors with flukes pivotted on a pin joint. The shank is formed of "three or more edge pieces" or flat bars of iron, welded together at the stock end and with holes therein for the stock and ring, the former oval, the latter round. The two outer pieces may be rounded on the outside. The pieces "radiate slightly from the point at "which they are welded together at the stock end, so that "at their lower or crown ends they are sufficiently apart to "admit of edge plates or pieces, of which the 'anchor arms' "are formed being slipped in between them," and the whole secured by a bolt upon which the arms swivel. The arms are made of plates like the shank, apart at the crown, but united at the ends to which the flukes are welded. The flukes are preferably oval. The horns are "flat plates or 'palms' "placed across the back of the arms at an angle of about "forty-five degrees from the face of the main palms" and are welded to projections "formed on the outer edges of the edge "pieces" forming the arms.

The stock is "of the ordinary description, made from an "oval bar."

[Printed, 1*s*. 2*d*. Drawing.]

A.D. 1856, June 10.—N° 1379.

CHESHIRE, CHARLES ROWE, and **BETTELEY**, JOSEPH.—(*Provisional protection only.*)—The entire Specification runs as follows:—

"This invention relates to improvements in the manufacture "of anchors, having a joint connecting the 'shanks' to the "'arms' of the anchor, and consists of forming the arms of "solid iron, having a hole in the centre to allow the shank "to pass through and is there connected by a bolt passing "through both arms and shank, the hole in the arms being "sufficiently large to allow the arms to work as in the anchor "known as 'Porter's.' The shank and arms are formed with "projections or enlargements at the throat or crown end, "sufficiently large to prevent the arms from turning beyond "a limited distance, so as to prevent the arm or palm of the "anchor resting on the shank. The anchor arms are formed "in one piece having a hole in the centre for the shank to "pass through. It is also proposed to make arms of two "*separate* pieces, that is to say, one part or piece forming a

" complete arm with its palm, the tennon of the arm being " sufficiently long to connect it to the other arm, so that when " both are pieced together at the tennon ends there is formed " what is called double solid arms, having the hole for the " shank to pass through."

[Printed, 4*d*. No Drawings.]

A.D. 1856, July 25.—N° 1773.

HOWES, EBENEZER. — (*A communication from Captain Samuel Clarke.*) — (*Provisional protection only.*) — The following is all the Specification :—

" The object of this invention is to permit of the stocks of " anchors being turned parallel with the flukes, whereby the " stowage of anchors, whether on the forecastle or at the ship's " sides, may be readily effected, without the necessity of un- " stocking the anchors. The shank of the anchor is made with " a shoulder at its upper part, and immediately above this the " shank is squared to fit the square socket in the stock. This " squared part of the shank is equal in length to the thick- " ness of the stock and above it the shank is rounded and " slotted to receive a cottar. When the stock is fitted to " the squared part of the shank, a cottar, connected to the " anchor by a chain for safety, is driven into the slot, and " thus the stock is held fast in position." " To shift the " stock and turn it round parallel with the flukes, it is only " necessary to drive out the cottar and lift the stock off the " squared part of the shank, it will then be free to turn as " desired."

[Printed, 4*d*. No Drawings.]

A.D. 1856, July 26.—N° 1780.

DICKINSON, JAMES.—" This invention is applicable to the " class of anchors known as 'swivel anchors,' and these im- " provements consist in forming and fitting the 'togles' to the " anchor arms by a working joint." The inventor says, " in " constructing anchors with my improved movable 'togles,' " I prefer to form them with a stock and solid shank in the " usual way, except that the 'crown' end of the shank I con- " struct with three tenons, having a hole passing laterally " through them, for the insertion of a locking pin or bolt "for jointing the flook arms thereto. In making the shank "of the anchor, I prefer to forge the stem of the shank "and centre tenon from one piece of iron, and then weld "on the outer pieces or tenons; and the middle tenons I "make considerably stronger and a little longer than the "side ones, to allow a hole to be formed through it for "the insertion of a bolt for a buoy-rope shackle to be "attached thereto without interfering with the swivelling "of the arms of the anchor. The anchor arms I propose "to form by laying together laterally two suitably shaped "pieces of iron, having lumps of metal formed on their ends, "and which lumps I bring together and form into 'Dutch' "or 'solid palms,' but they may be constructed from two "pieces of suitably shaped metal, having their points brought "together, and to which the common palms may be fixed. "The two lateral pieces of which the anchor arms are formed "I place sufficiently apart in the centre of their length to "allow them to be slipped in between the tenons formed on "the 'crown end' of the shank, and to which they are jointed "by a stout lock, pin, or bolt, passing through the whole, "and upon which the arms swivel." A modified form of these "togles" may be applied to anchors with solid flukes.

[Printed, 6*d*. Drawing.]

A.D. 1856, December 6.—N° 2901.

SMITH, Stephen Randoll.—An improved anchor is described. It is double, that is, it consists of two shanks with arms and flukes united at their upper parts where they have a common stock. From that point they diverge. Between their crowns is fitted a "crown plate" which is pivotted by studs on it fitting into holes in the shanks. On these studs the arms are firmly fixed, and they "move between forked "ends in the ends of the shanks." Or the "crown piece "may be fixed, and arms work or turn on the necks of "the crown piece." The palms may be "single" or "double "and connected together" in which case "the arms are made "double and are attached by pin joints to the shanks." The "crown plate" may be dispensed with if preferred. The "front parts of the palms" are made "each with a projecting angular blade." The different parts of the anchor may be used separately to form "single anchors."

[Printed, 10d. Drawing.]

A.D. 1856, December 11.—N° 2935.

BURKE, Michael.—The invention consists in connecting the shank of anchors to the piece forming the arms "with a joint " or hinge near where the shank joins the crown of the anchor " instead of being in the crown thereof." There is a short projection from the crown, and this is pin-jointed to the shank. A shackle is attached to the end of the pin for use in fishing the anchor. The inventor says in the Provisional Specification :—"I divide the shank at such a distance from " the crown that when the point of one fluke rests on the " top side of the main shank while placed horizontally, the " opposite fluke shall be vertical."

[Printed, 6*d*. Drawing.]

1857.

A.D. 1857, January 16.—N° 132.

HAYCRAFT, Samuel. — (*Provisional protection only.*) — Various improvements in anchors are described.

1. Making the flukes convex.—The "front face of the fluke" projects "in a direction from the top to the bottom, either in " the form of a segment of a circle or by dividing the length " into two or more" "parts, either part from the point " receding more and more towards the back of the arms." The fluke is "flat crosswise on its face."

2. "Cutter arms."—The arms are brought to a thin edge in front and have a cutter attached to them. In mooring anchors with one arm, the arm is cut short "at the back above the " fluke" and brought "forward."

3. Attaching shackles. — The pin-hole of the shackle is sufficiently large to admit the stock. In one-arm anchors the shackle pin is "above the centre line of the shank."

4. "Joint arms."—The joint pin passes "through the shank " and arms at the crown in the usual way, in conjunction with " another some distance from the former and nearer the fore " part of the anchor." " The hole through the arms for " this pin to pass through a slot hole;" "or two projections

" may be used to clip the shank, at the same time allowing " some action at the joint sufficient to permit each fluke to " collapse about one-fourth part nearer to the centre of the " shank."

5. "Central stock anchors."—"The centre of the sweep for " the centre of the stock" is preferred, "but if placed one- " fourth of the radius of the sweep in advance, the usual " length of stock will cant the anchor." "If placed in the " centre a shorter stock will suffice, and if placed between the " points of the flukes a stock of the same length as the span " of the flukes will be sufficient." The stock is fixed "nearer " to the centre of the outside sweep of the arms" than usual.

6. "Four-armed anchors."—The flukes and arms as above are used. The flukes are "on the face plain, of a triangular " or nearly triangular form, one point forming the upper part, " and one side the lower part of the fluke, thus presenting the " points to the ground."

[Printed, 4*d*. No Drawings.]

A.D. 1957, April 8.—N° 985.

HINGLEY, Benjamin, and HINGLEY, Samuel.—The horns of anchors are made separate from the flukes, and are forged each with a "peg or tenon" thereon. This tenon fits in a slot in the back of the arm and is secured by a pin passing through the arm and tenon.

The ends of the stock are bent at right angles towards the arms, and have knobs on them to prevent their entering the ground.

[Printed, 6*d*. Drawing.]

A.D. 1857, May 6.—N° 1276.

HINGLEY, Benjamin, and HINGLEY, Samuel. — (*Provisional protection only.*) — The following is the whole Specification :—

"Our invention consists, firstly, in making an enlargement " on the shank of such anchors as have the flukes or palms " hinged or jointed to the shank. The said enlargement is " made at that part of the shank against which one of the " flukes or palms bears when the anchor is aground. We " *prefer to* make the shank at the said enlarged part about "double the ordinary width. We curve the flukes or palms "outwards, so that when the anchor is aground, the fluke "resting on the ground is, by its curved form and the position "which it takes against the enlargement, sufficiently open to "take into and engage in the ground. By this method of "construction we dispense with the toggle or horn usually "employed in hinge anchors.

"Our invention consists, secondly, in making two oval or "other shaped holes, one on either side of the shank of the "anchor, for the purpose of fishing the anchor thereby. In "hinge anchors having the enlargement herein-before described, "we prefer to make the said holes in the said enlargement. "That part of our invention which consists in curving the "flukes outwards is applicable to all kinds of anchors."

[Printed, 4*d*. No Drawings.]

1858.

A.D. 1858, March 5.—N° 438.

BOYCE, CHARLES.—An anchor is described which is one of those with the arms in one piece pivotted to the shank. Above the arms, and lying close upon them, is a second piece of similar shape, pivotted to the shank immediately beyond the arms. The ends of this piece are furnished with flat plates turned down on the arms so as to grip them; these slide on the arms when the latter turn on their pivot, and bear against projections on the ends of the horns, which are pivotted to the arms, thus raising the horn pressed against into position. It is stated that when the anchor is cast overboard, the sliding of this plate will bring the horn of the lower arm into a position to take the ground and thus open out that arm. The horn on the upper arm lies flat on the arm, and risk to the vessel's bottom therefrom is avoided. Instead of keying the stock and shank together by a pin passing through both where the stock passes through the shank, the former has a feather on it which fits in a slot within the hole in the shank which retains the stock. A pin passes through the shank and through this feather. The feather only extends along the stock at the part where it crosses the shank.

[Printed, 6*d*. Drawing.]

A.D. 1858, April 23.—N° 903.

LUNGLEY, CHARLES.—"Portable ships and boats."

A method of constructing such vessels is described. For use with them a special portable anchor also is described. The arms and crown are formed of an arched plate of iron, or two thinner plates. The flukes are formed of plates fixed by bolts and nuts to the arms. The shank is bolted to the crown. A chain is fixed across from each arm near its point to the shank near the stock, and as shown in the drawing, a third chain may unite these near their middle points. Rods may be fixed in the same way instead of chains. The shank may be jointed.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1858, December 20.—N° 2908.

HUNTER, SAMUEL.—The improvements apply principally to anchors in which the arms are pivotted to the shank. The arms are made of two side plates with the shank pivotted between them. These plates are welded to the fluke and horn, which are made in one piece. "They are welded one "on to each side of the palm" "thereby entirely enclosing "it and leaving no portion of the palm projecting beyond the "sides of the arms." The "inside of the palm is made "slightly convex in its length."

The improvements are also applicable in part to anchors with fixed arms. These are constructed without horns, and cross plates may be fixed between the side plates of the arms.

In the Provisional Specification an improvement in the stock is described. It is made "in two halves, each half being "jointed by a pin joint to a piece forged on the lower end of "the shank." No allusion is made to this in the Final Specification.

[Printed, 6*d*. Drawing.]

A.D. 1858, December 30.—N° 2982.

MAYNARD, Henry Nathan.—(*Provisional protection only.*) —The invention is carried out "by making anchors of plates, " bars, angle, and other sections of iron, cut to the necessary " shapes, and rivetted, bolted, or welded together, so as to " obtain greater facility in their manufacture, and the ad- " vantage of an increase of strength throughout, with the use " of a much less weight of metal."

The above is the whole Specification.

[Printed, 4*d*. No Drawings.]

1859.

A.D. 1859, June 3.—N° 1362.

EDWARDS, John.—(*Provisional protection only.*)—The entire Specification runs as follows :—

"My invention relates to the making of anchors, or parts of " anchors, of plates of metal instead of forging them as at " present. Plates of metal are formed of suitable dimensions, " these plates are then fastened together by means of screws " or rivets; also to the application of stays or crutches to " support the arms of anchors to relieve them of the strain; " and to the making of anchors without a stock, a frame of " metal is made with suitable cross pieces, on which the arms " of the anchor is made to revolve."

[Printed, 4*d*. No Drawings.]

A.D. 1859, August 27.—N° 1958.

RETTIG, Emil.—(*Partly a communication from Ferdinand Martin.*)—"Form and construction of anchors."

The anchor has tumbling flukes, the arms being in one U-shaped piece and swivelling in the shank so that both flukes take the ground at once. The end of the shank is deeply slotted at right angles to the arms, so that a throat piece fixed on the arms may fit within the slot and by bearing against the throat of the slot, limit the play of the arms. This piece has projections on it which take the ground at the same time as the flukes. There is also an additional fixed pair of arms which may be either curved or straight; these are in the same plane as the tumbling flukes, when the latter are parallel with the shank. There is a shackle at the crown for attaching a buoy rope.

[Printed, 10*d.* Drawing.]

A.D. 1859, October 5.—N° 2261.

SCOTT, John.—"Manufacture of anchors."

Improvements on No. 39, A.D. 1855. They consist in (1.) "forming the shank of a single piece" in anchors with the arms pivotted to the shank. The whole of the shank is forged in a single piece, a mandril being used to preserve a space for the arms, or a piece may be cut out from the shank therefor.

Also in (2.) forging both arms and both flukes out of a single piece without welding.

[Printed, 4*d.* No Drawings.]

A.D. 1859, November 12.—N° 2569.

SCOTT, John.—The "invention relates to anchors generally, " but principally to those anchors in which the arms carrying " the flukes move about a pin or bolt at the end of the shank, " and consists in fitting a toggle to each arm in lieu of the " 'horns,' which are now welded to them." The toggle is formed preferably of three pieces of metal, "two side plates " formed with a lug and an aperture therein for the reception of a pin or bolt, and a filling up piece or block which is curved " at bottom and held by pins or rivets between the two side " plates. A bolt is passed through the side plate and through " a hole formed in the arm in order to secure the toggle " thereon. The toggle moves upon the bolt within limits " determined by the curve on the bottom of the filling up " block; the toggle may also be made in one or two pieces " with lugs projecting downwards and embracing the arm." The toggle is made "a fixture by moving the bolt from the " centre to a little on one side of the centre of the lugs."

[*Printed,* 6*d.* Drawing.]

A.D, 1859, December 6.—N° 2761.

WOOD, Edwin Archer.—(*Provisional protection only.*)—This invention is carried out "by constructing the shank of "the anchor divided crosswise or in two parts connected "together by a strong piece passed through a toggle joint, "formed upon that part of the anchor to which the flukes are "welded, or otherwise fixed or connected; the lower end of "the upper portion of the shank" being "curved as a moveable knuckle, so as to fit into a corresponding recess formed "in the toggle joint." There are "either straight or curved "short arms on such said curved moveable knuckle, so that "in the act of weighing an anchor thus formed the effect is to "cause one or other of the short arms of the aforesaid knuckle "to press against or upon the edge of the curved part of the "toggle joint aforesaid and by so doing to exert leverage upon "the lowermost part of the shank, thereby breaking the ground "in which the flukes of the anchor are embedded."

[Printed, 4*d*. No Drawings.]

1860.

A.D. 1860, January 24.—N° 174.

REED, Charles Holloway.—"This invention is applicable "to that class of anchors known as portable or swivel anchors, "and consists principally in forging the arms of such anchors "with lugs or jaws on to receive the end of the shank, which "is connected thereto by means of a pin or bolt, with forelock "and ring. The arms may be either forged or made in one "or more pieces, as found most desirable or convenient, and "the toggles or horns will be either welded to the arms, or "they may be made to fit with bolts or pins through the "arms. The shank is formed of one solid piece of iron."

[Printed, 6*d*. Drawing.]

A.D. 1860, May 8.—N° 1140.

GLADSTONE, Thomas Murray.—(*Provisional protection only.*)—The invention may be applied to anchors with a pivot head or a fixed head.

In the first case the head consists of a plate, broad at the crown and tapering towards the points, bent into a semicircular shape; joining the points is a solid curved bar, of larger curve than the outer plate. At the crown these two are united by a solid piece to which the fork on the end of the shank is pivotted. On the outside of the head are forged lugs, which act as horns to open the arm out from the shank. The head thus in form resembles an arc with its chord, except that the chord as it were consists of a curve instead of a straight line. The shank "may " be made of strong rolled flat iron of the required size in one " continuous bar round the stock hole, with filling-up pieces " at the points required to be solid."

In the second case the head consists of a plate as above, but having a strong iron rib along its back so that it is of **T** section. There may be holes for buoy ropes in the rib. A "tubular " iron stock" may be used, of tube iron filled with a bolt in the centre, and, if preferred, at the ends with wood. It has a collar on it which bears against one side of the hole in the shank. There may be on it a stud which passes through a slot in the shank, and, when the slot is partly turned, bears against the shank and holds the stock in place. Also the stock may be in two pieces screwed on the ends of a bolt fixed in the stock-hole. The shackle has two eyes, and is shipped over the stock, one eye on each side of the shank.

[Printed, 6*d*. Drawing.]

A.D. 1860, October 9.—N° 2458.

DANBY, Francis.—" The shank of the anchor is divided and " forms two arms, these are connected together at their apex " and form a circular crown which is furnished with a shackle " to receive the cable. Below the crown the said arms open out " somewhat in form of a 'lyre,' and their ends are furnished with " holes to receive the bolt which carries the fluke or holding " blade. The said fluke consists of a strong broad blade, taper- " ing down thin towards the end which first enters the ground,

" its other end terminates in a massive base, passing through " which is a bolt for connecting it with the said shank arms " between which it is freely suspended. The base of the said " fluke being heavier than its holding portion causes the same " to be suspended in a vertical position as the anchor descends " from the ship, and on the fluke's base touching the ground " the said fluke is caused to turn over on its bolt or pivot, and " at once assumes the position necessary to enable it to enter " and hold in the ground, which it does by resting on the said " shank arms against shoulders provided on the base of the " fluke."

[Printed, *6d.* Drawing.]

A.D. 1860, October 10.—N° 2466.

SCOTT, John.—(*Provisional protection only.*)—"Manufac- " facture of anchors, and an improved apparatus to be " employed therein."

The inventor says, "My invention consists, first, in forging " the two arms with the two palms and the shank in one piece " without any weld being required in the anchor shop. To " accomplish this I have invented a new trough, which forms " part of the bed plate of the steam hammer, and which I " claim as my invention also. Instead of a flat bed for the " hammer to work upon, as in ordinary steam hammers, I " employ a trough or bed formed with an open space, so that " the shaft and arms not being hammered on under the " hammer, but going down below it in the open space, " by turning and moving the anchor every part can be " brought under the hammer, whereas if the bed was flat, " as in the ordinary steam hammers, this could not be " done."

[Printed, *4d.* No Drawings.]

1861.

A.D. 1861, January 5.—N° 37.

GRYLLS, John Isaiah. —(*Provisional protection only.*)— " The crown and arms of an anchor are constructed with a

" short shank in the upper end of which is formed an eye or " opening to admit of its being connected by a pin joint to " part of the shank, to which the stock is applied, which part " of the shank is formed with a fork end beyond where the end " of the shank which carries the arms and crown is connected, " the two limbs of the fork extending on either side of the " lower part of the shank to the crown; by this arrangement " the end of the shank which carries the arms and crown will " be enabled to assume an angular position in respect to the " upper part of the shank and its forked end or continuation " plates."

The above is the entire Specification.

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 20.—Nº 699.

PEACOCK, George. — (*Provisional protection only.*) — " The shank is composed of two wrought-iron plates con- " nected together at a distance apart." The plates are kept " at the required distance apart by filling pieces at the head " and crown; between these plates is a single straight arm " without any palm at its extremity, the arm is about half " the length of the shank, and turns at its base on a bolt near " the crown end of the shank, and the point of the arm lies " towards the head of the shank; the arm is capable of passing " freely between the plates of the shank, so that it can be " made to project from either side of them, and at the base of " the arm are two semi-circular flukes for the purpose of " catching in the ground, and causing the arm to project from " one or other side of the shank, and so make it to enter the " ground, the end of the arm being either made chisel-shape " or pointed. On the shoulder of each of the flukes is a " pointed projection, so that if, when the anchor is on the " ground, the point of the lower fluke be between the shank " plates, the projection may catch in the ground, and bring " the fluke into action." "The flukes have stops projecting " from each of their sides" which, "come against the top and " bottom edges of the shank plates, and thereby stop the " movement of the arm, the arm is also stopped by one of " the flukes coming against the filling piece at the crown end " of the shank." There is a stock at the "crown end of " *the shank*" preferably bent round "on each side of the

" shank" and connected to the head "in such manner as to " form a pear-shaped bow or rim around the shank, the " broadest part of the bow being towards the crown, and on " each side of the shank at a point about one-third the length " of the bow from the crown" there is "a bar or stay which " connects the bow with the shank plates." "The sides of " the arm which are towards the flukes are raised angularly " in the centre," and "the inner portions of the bow-formed " stock and its stays are also made angular on the top and " bottom edge, and are rounded on the sides."

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 1.—N° 1372.

WILSON, Robert.—The shank of an anchor is hollow and built up of plates of iron, &c. with turned up edges which are rivetted together. It may be round, square, or other suitable shape, and may have "mid feathers" in the inside.

The arms are T shaped in section, "the lower limb forming " a strengthening ridge on the outer side. The arms may be " formed of one piece of metal bent to the required shape and " pointed at each end; or the upper portion may be made of " a plate pointed at the ends and bent to the desired form, " and strengthened by riveting on to the convex side thereof " a piece of T-metal." The shank is joined to the arms by a collar of angle iron rivetted to both, and by a metal web partly filling the spaces between the shank and arms.

The stock is made of T bars or in the same way as the shank.

Where greater strength is required, "two pieces of T-metal " or three or four pieces of angle metal riveted together may be used. "And these may be additionally strengthened " by fitting in two or more of the angles with longitudinal " segment pieces."

[Printed, 8*d*. Drawing.]

A.D. 1861, September 18.—N° 2330.

FERRY, George. — (*Provisional protection only.*) — The following is the whole Specification :—

"According to my invention I connect the shank of an anchor " to the arms by a ball-and-socket joint or connection, so that

" the shank may move in various directions, and take various " angles or positions with respect to the arms, while still re- " maining connected to them. This can be effected, for example, " by forming the shank with a rounded, spherical, or ball end, " fitting and working in a hollow or socket in the crown. I " generally form on the inner side of the crown, or at the " throats of the anchor, as many recesses, openings or grooves, " as there are arms, such recesses, openings, or grooves lead- " ing into or forming part of the hollow or socket in the " crown, so that the shank when inclined may fall into one of " the said recesses or openings, and bear or rest against the " corresponding arm. I prefer to construct the anchor with " three fluked arms. The invention is applicable to grapnels " as well as to other descriptions of anchors."

[Printed, 4*d*. No Drawings.]

A.D. 1861, September 20.—Nº 2349.

GLADSTONE, Thomas Murray. —(*Provisional protection only.*)—The entire Specification runs as follows, "I make my " anchor with a joint or pivot in the well known manner as " Porter's, so far as the arms are concerned like to them, but " having a palm that shall have a convex surface on the inner " side and the back of which shall be parallel to the back of the " blade or thereabouts, declining from down the centre to the " sides, the centre being in line with the curve of inside front " of arm or thereabouts, the front of the palm that rests upon " the shank on the upper side when in use either rests in a " groove fitted to it on the shank, or is protected from leaving " its impact on the shank by raised parts on either side of the " shank, whereby a great support is given to the joint at the " crown and other parts of the anchor on any strain upon it " in the veering of the ship. I also make what I term a " compound stock to consist of top and bottom plates of " proportionate length, breadth, and strength, to be bolted " together so as to clasp the square of the anchor, and having " between them and secured at right angles cross plates or " clamps that shall grasp the nut or nuts of the anchor and " between the plates in each arm of stock is fixed wood or " other suitable material to keep the plates asunder. First, " *I claim* as my invention the grooves on the upper and lower

" side of the shank, and the raised parts in lieu thereof when " used. Second, the compound stock with the modifications " thereof."

[Printed, 4*d*. No Drawings.]

1862.

A.D. 1862, April 2.—Nº 931.

HUNTER, Samuel.—The shank of an anchor is made with a loop at its end through which the arm connecting a pair of tumbling flukes passes. A pair of jaws is formed on the lower part of this arm and these are pivotted to the bottom of the loop, so that the arm has play from side to side within the loop. A projecting piece on the arm on each side bears against the side of the loop and comes against a stop thereon, which prevents the flukes swivelling to too great an angle.

[Printed, 10*d*. Drawing.]

A.D. 1862, May 27.—Nº 1586.

CUNNINGHAM, Henry Duncan Preston.—(*Provisional protection only.*)—The following is the whole Specification.

"The object of my invention is to manufacture anchors " in which penetrating and holding powers are combined, " together with facility for breaking out of the ground when " being weighed. My invention consists in constructing the " arms of anchors to terminate in a 'pick' or penetrating bar, " similar to that of an ordinary pick-axe, and in forming a " fluke or broad holding surface at the inner end of the pick, " and between it and the shaft or shank. The pick-axe termination of the arms will ensure penetration, while the fluke " or broad surface thereof or thereon will impart great holding " power. In weighing also, the particular construction of the " arm will enable it readily to break out of the ground."

[Printed, 4*d*. No Drawings.]

1863.

A.D. 1863, April 29.—N° 1080.

RODGER, WILLIAM.—The arms are shorter in proportion to the shank than usual. They are wedge-shaped in section "varying in sharpness from the throat to the head of the "palms." "The back part of the 'arms' is made parallel "from palm to palm, and is much thicker than their front "part, which is tapered in the direction of the point." The shank is "rectangular at its junction with the arm, and "square at the shank close to the collar for the stock." The arms also are broader "in the direction of the strain" than usual. The palms are generally like those described in the Specification of No. 2603, A.D. 1853. They have their "front parts double-concave" with a "border" round them, and a recess behind. The object of this is to give the ground holding power on both sides of the palm. The crown is "larger than usual" and has a countersunk hole therein. "The point of the 'palm' which is about one-fifth "part of the length of the 'arm,' forms an angle of about 60° "with the shank, whilst the edge of the 'palm' makes an "angle of only about 20° with it."

The stock has an enlargement in the centre which cuts a rut for the shank to lie in.

In forging the anchor, the shank is made in the shape of a cross, forged out of the solid, and the arms are scarphed thereon and welded. The palms, part of the arms, and the middle of the stock are made "in cast-iron dyes or moulds, into "which they are driven by means of the forge hammer." The required holes are drilled, and the hole at the back of the palm punched out.

The stream and kedge anchors are made in the same way, but without palms.

[Printed, 1*s*. 6*d*. Drawings.]

1864.

A.D. 1864, January 29.—N° 242.

BONNEVILLE, Henri Adrien.—(*A communication from Jean Baptiste Adolphe Boyer, Amedée Pierre Vincent Varenne, and Louis Alphonse Bonin.*)—(*Provisional protection only.*)—The arms of an anchor are hinged to the shank and have upon them short arms which when the anchor is in use lie against the side of the shank and are held there by a sliding collar. This collar is held in position by a pair of spring catches taking into a notch in the shank, and can be raised by a bolt sliding along the shank. To weigh anchor this bolt is drawn by means of a line from on board ship, and the arms fall down into a line with the shank.

[Printed, 6*d*. Drawing.]

A.D. 1864, April 11.—N° 905.

JONES, Thomas Cutler.—(*A communication from Charles Edgar Marshall.*)—The arms of an anchor swivel independently on a pin across the shank at the crown. On the shank are projections to keep the arms in proper holding position. Also the arms may be secured together or to the pin, so as to work together. They have on them "palmlets or barbs." When not in use the arms may be lashed to the shank, and there may be holes in the shank for the lashing.

[Printed, 8*d*. Drawing.]

A.D. 1864, April 30.—N° 1103.

MEACOCK, William Isaac.—(*A communication from Henry Scholfield.*)—The arms of an anchor are pivotted separately one on each side of the shank. A projecting shoulder on the end of the shank is formed so as to act as a stop on each side, to prevent the arms swivelling too far in either direction. "Two points or angular projections are formed on the upper " and under surface of each fluke at their junction with the " arms, presenting a right-angled holding surface to the " flukes."

[Printed, 6*d*. Drawing.]

A.D. 1864, May 4.—N° 1129.

NEWTON, Alfred Vincent. — (*A communication from Charles Alexander Chamberlain.*)—The shank of an anchor is forked, and to each prong is fitted a fluke. Both flukes are turned to one side, so that they take the ground together. The prongs are joined by a semi-circular bow extending in the opposite direction to the flukes. This is termed a "reversor." It is supported by a stay extending from the throat of the fork. The object of this bow is to roll the anchor over on to the points of the flukes, if it falls with the flukes upwards. At the other end of the shank is pivotted a pointed arm. The pivot on which it turns is parallel to the flukes, so that the arm traverses in a direction across the flukes. The object of this arm is that if the anchor falls on its side, the arm may stick in the ground and cause the end of the shank to be raised, thereby making the flukes tend to catch in the ground. This arm is termed the "elevator," and a rib on the shank to which it is attached the "depressor." Holes are pierced in this rib for the attachment of the cable, and the cable may be attached to a higher or lower one of these, according to the shallowness of the water, and the consequent direction in which the strain on the cable acts. At each side of the shank near the "elevator" are "two curved elbow-" shaped pieces of iron" which form a "guard."

[Printed, 8*d*. Drawing.]

A.D. 1864, May 6.—N° 1154.

MARTIN, François.—An anchor is described with tumbling flukes, the flukes being united in one piece, and swivelled in the shank so that both take the ground at once.

The shank is formed in two longitudinal sections secured by screw bolts. The "crown piece or web portion of the anchor" is made "with its palms in two sections" bolted together. "The bearing edges of the crown piece take place at just " half of its length from its centre point, that is to say, instead " of the palm of the crown resting on the shank, the interior " curve of the crown piece rests on the shank between the " two cheeks at distances from the central line limited by " angles of forty-one degrees thereto, and half or midway " *between* the points of the palms of the crown and the

" central line thereof." The "barbs of the flukes" are dispensed with, and an "inner hook" substituted. The "pointed " end of each fluke" is by preference bayonet shaped; that is, the faces of the fluke are "scolloped or slightly hollowed." The inventor also proposes "to apply the before-mentioned " description of anchor in a duplicate form, so as to construct " a double or backed anchor, the head or cheeks of one being " extended so as to form a forked joint, with two holes for " the insertion of the pin in order to be attached by a universal jointed link or shackle to the ring end of the shank of " the other." In this case the flukes of the point anchor are smaller than those of the rear anchor. The ring for the buoy rope "must be dispensed with in regard to the fore or backed " anchor, in order to allow of the play of the palmed crown " on the cheeks." "The inner hook on the flukes may be " made of a length such that the flukes would not be able to " pass through the cheeks of the shaft if the hooks were " fixtures." For this purpose there are slots cut in the palms, and into these the "hooks" are pivotted so that they may lie within the slots, but fall outwards by their own weight when required. The "flat or cutting edges of the flukes," are carried "higher up towards their union with the shank." About the place usually occupied by the stock is a cross-bar, resembling a stock, but fixed in the same plane with the flukes, instead of at right angles to it. This is termed the " steadying bar;" it is in two parts or sections of angle iron " rivetted together." It may be either straight or curved. " A space is cut out of the middle of the horizontal plates of " the angle iron and a corresponding aperture is cut in the " front or vertical plates for the adjustment of the bar against " a shoulder formed on the shank." The "steadying arm" may be of such shape as to offer resistance to the dragging of the flukes.

[Printed, 10*d*. Drawing.]

A.D. 1864, July 8.—N° 1700.

SHARP, Stephen.—(*Provisional protection only.*)—"The " anchor is made in three parts readily put together or " taken to pieces; first, the anchor stock; second, the arms " in one piece; and, third, the block or stay keeping the

" other two parts intact. The anchor stock is made with an " opening at the head, so formed as to allow the arms to " be passed through, giving sufficient room for any width of " fluke required. The head of the stock forming one-half of " bearing in which the arms partially revolve is fitted into the " opening left in the anchor stock, and is wedge-shaped and " dovetailed at the small end, requiring only one light steady " pin or bolt to secure it in its place. The arms being manufactured with clutches, one on each side of the stock, and " the block projecting to meet the corresponding projection " of the clutches, the two, when the arms and flukes are at " the proper angle for taking hold of the bottom, are closed, " forming a true mitre, and of a substance corresponding in " strength with all the parts of the anchor."

"A steadying bar" "may be applied or not at option."

[Printed, *4d.* No Drawings.]

A.D. 1864, July 22.—N° 1830.

SNELL, Edward, and ALLIBON, George.—The following improvements in anchors are described :—

"The cross arms which carry the palms extend on each side " of the shank, and the central part of the said cross arms is " cut out, forged, or slotted so as to receive an eye at the end " of the shank. This eye is made of great strength, and the " arms are connected to it by a strong pin, which passes " through but allows the arms to turn on it as on a centre. " The arms are bent round into a position parallel with the " shank, which is formed with two projecting shoulders or " blocks, against which corresponding shoulders on the central part of the cross arms are made to bear when the palms " are holding in the ground. The arms are also provided on " each side near the angle or bent part with a pair of projecting horns, one horn being on each side of each of the arms, " so that, in whichever way the anchor may be dropped on " to the ground, two of the horns will rest thereon, and cause " the ends of the palms to be pointed downwards so as to " ensure their catching into and holding in the ground. The " slotted or central part of the arms is provided with a shackle " or ring to which is attached a buoy rope."

[Printed, 6d. Drawing.]

A.D. 1864, August 4.—N° 1946.

DRUCE, George Frederick.—The anchors are those with swivelling flukes in which both flukes take the ground at once. Instead of the arms being passed through an aperture in the shank, a hollow is formed in the top of the shank for their reception, and they are held fast by means of an iron cap placed over the top of the shank, and of such shape as to fit over the central portion of the arms and the top of the shank. The cap may be secured in a suitable way, as by lugs, by a pin, by a collar sliding over the cap and stock, or by a combination of any of these.

A suitable arrangement may also be made for holding the arms in the proper position for taking the ground, such as a projection on the arms taking into a corresponding groove in the cap or the end of the shank, or any similar arrangement.

[Printed, 1*s*. Drawings.]

A.D. 1864, October 21.—N° 2604.

MARTIN, François.—An anchor has swivelling flukes which both take the ground at once. The shank is formed "flat " from end to end, except near the head, which may be " enlarged or formed with projecting palms." "A circular " hole or eye is formed at the head to receive the U-shaped " arms." The head of the shank is formed with projections " which serve as fulcra to withdraw the flukes" when the free end of the shank is "being first raised."

Several methods are figured and described for mounting the arms on the shank, and arranging stops to limit the movement of the arms. The central part of the arms, where they fit in the eye, may be formed with a collar on which are projections fitting against stops on the shank. Or there may be a curved " recess" "partly around the circumference of the central " axis of the arms," into which a key on the shank fits. Or ribs may be formed on the arms and shank which act in a similar manner. "Side covering plates are fixed on each side " of the shank projecting over the central collar to retain the " arms in a central position in the eye."

The next part of the invention refers to a method of mounting the arms "in the eyes of the forked end of the shanks of " anchors known as 'Martin's anchors.'" The eyes in the forked end of the shank are circular. "One or more slots or "key ways" are formed "in the eyes of the shank and of the "rotating sector or crown piece, to allow the arms" to pass through. The central part is made with ribs corresponding with slots in the eyes of the shank and crown piece, so that the latter may be secured to the arms by pins, &c.

The following part of the invention consists in forming the points of the flukes with hollow curves on each side "and in "hollowing out the inner and outer edges of the flukes from the "point upwards to the hooks formed on the inner part of the "palms." The arms above the flukes are preferably hexagonal, octagonal, or of other section having flat surfaces, instead of being round.

"Steadying arms" "mounted on the free end of the shank" of an improved form are used. "The width of the curved or "inclined steadying arms taper off from the shank to their "extremities, which are of curved form" so that they lie flat on the ground, and offer resistance to the dragging of the anchor.

[Printed, 10*d.* Drawing.]

A.D. 1864, November 18.—N° 2878.

SHARP, Stephen.—(*Provisional protection only.*)—"The "anchor is made in 3 parts readily put together or taken "to pieces; first, the anchor stock; second, the arms and "palms or flukes made in one piece, and third, the block "or stay keeping the other two parts intact. The anchor "stock is made with an opening at the head, so formed as to "allow the arms to be passed through giving sufficient room "for any width of fluke required, the head of the stock forming "one half of bearing, in which the arms partially revolve, the "block forming the other half of bearing. The block is fitted "into the opening left in the anchor stock and is wedge-shaped "and secured with a bolt. The arms being manufactured "with clutches on each side of the stock, and the block pro-"jecting to meet the corresponding projections of the clutches, "the two when the arms and flukes are at their proper angle "for taking hold of the bottom form a mitre, the whole being "made of proportionate strength." "A steadying bar" "may "be applied or not at option."

[Printed, 4d. No Drawings.]

1865.

A.D. 1865, February 14.—N° 420.

TROTMAN, JOHN.—Mooring anchors.

The anchor is formed in two parts and has a stock of the usual form passed through the end of the shank. The holding part of the anchor is preferably of cast iron or steel, with a hole through it to receive the end of the shank. "The shape " of the holding part is somewhat similar to a ploughshare on " each side of the shank. The front end of the holding part " of the anchor is pointed and widens out to the back end, and " the mass gets thicker and thicker towards the back end. " The under surface may be made more or less hollow or flat; " the upper surfaces on each side of the central line from the " front to the back end are inclined and curved. The trans- " verse section of the part on each side of the central line is " composed of a series of curves. The shank is composed of " wrought iron or of steel forged straight or nearly so for the " greater part of its length, the transverse sections however " varying in area according to the strain each part is intended " to bear. At the back end the shank is bent downwards, " and passes into and through the holding part of the anchor, " and is there keyed or secured in the holding mass towards " the back end of such mass." It is stated in the Provisional Specification that "in some cases the stock at its back end is " made or formed double or forked, and passes into the " holding block or mass through two holes formed through " the same," but no allusion to this is made in the Final Specification. "At the back of the holding part of an anchor " an eye or ring is applied to facilitate the raising or fishing " the same."

[Printed, 10*d*. Drawings.]

A.D. 1865, November 22.—N° 3004.

HUNTER, SAMUEL.—The anchor is one of those "known as " oscillating anchors" in which one fluke takes the ground while the other rests against the shank. The object of the invention is to do away with the necessity for horns. On the shank projections are formed on which the point of either arm may rest, and these projections extend the arms out, so that the points stand out and take the ground in the same way as the usual horns. There is a groove on the projection in which the point of the arm lies, so as to relieve the central pivot from lateral strain. "From the part where the arm rests in this groove it is in-" "clined towards the point of the palm, the palm being forged" "on the back of the arm." "That portion of the arm which" "is immediately in front of the palm is made to increase in" "thickness from the point towards the crown, and also from" "the inner edge to the back of the arm."

Instead of the projections on the shank, other means of limiting the axial motion of the arms may be employed. Thus the arms may be connected together by a cross "segmental" "or a double reverse curved bar, the centre part being curved" "outwards from the pin in the crown, whilst the parts nearest" "to the arms are curved in the reverse direction." This bar works through an opening in the shank, and has stops on it which come against the sides of the opening and limit the play of the arms.

[Printed, 1*s*. Drawings.]

1866.

A.D. 1866, June 2.—N° 1536.

JULIUS, Charles Theodore.—The stock of an anchor is constructed in two pieces called "stock pieces" hinged to the shank in such a way that they cannot fold towards the arms so as to form less than a right angle in that direction, but can fold in the other direction so as to become almost in the same line with the shank, and thereby allow any cable which has fouled it to clear itself. The "stock pieces" may be hinged in any convenient way. They may be forked and embrace the shank, so as to pivot either each on a separate pin or both on the same. Shoulders on the shank, bearing against the sides of the jaws of the pieces, prevent the pieces moving too far in either direction. These shoulders are of such a shape as not to offer any sudden projections on which a cable, &c., may catch. Also the pieces may be pivotted on the shank, in recesses formed so as to limit the action of the pieces.

[Printed, 10*d*. Drawing.]

A.D. 1866, June 14.—N° 1624.

LINNINGTON, ADOLPHUS HENRY.—(*A communication from Peter Dinzey.*)—(*Provisional protection only.*)—The following is the whole Specification :—

"This invention has for its object improvements in anchors.
" The shank of the anchor is one straight piece for about
" one-half its length, and about midway it divides into two
" parts, at first separating from each other obliquely a little
" and then continuing at an uniform distance from each other,
" the distance between these two parts or prongs of the forked
" shank being just sufficient to allow the fluke to play between
" them. The ends of the shank so divided are connected by a
" bolt upon which the fluke turns as upon a pivot moving
" between the two parts of the shank about sixty degrees
" each way. The fluke consists of a central rib passing down
" through the centre and having a blade on either side, thinner
" than the rib itself; the rib being thicker stands out from
" the blade on both sides. The ends of the divided shank
" where the bolt connects them have each an enlarged
" circular space round the bolt, and at a little distance above
" and below the bolt two triangular-shaped bars, one above
" and one below the bolt, reach across between the shanks
" and stop the fluke from moving beyond a certain angle
" from the shank, the fluke extending a little beyond the bolt,
" so as to rest on the bars. A stock passes through the other
" extreme end of the shank at right angles with the course
" which the fluke takes, the end of which is curved so that
" the stock may be brought down against the shank."

[Printed, 4*d*. No Drawings.]

A.D. 1866, July 27.—N° 1949.

HADDAN, JOHN COOPE.—(*Provisional protection only.*)—The invention "has reference to the causing anchors to
" readily take a hold of or grip into the ground though falling

"at random, and without the assistance of the stock." It "consists in constructing anchors with the arms and flukes, "while being disposed with reference to the shank as heretofore in respect of being bent or curved upwards or forwards "towards the end of the shank to which the cable is to be "attached, not disposed as heretofore in respect of being in "end view, or as seen looking in the line or direction of the "shank, with the arms or flukes in a generally straight line, "but instead thereof being disposed with the arms and "flukes in a generally curved line formed more or less like "the letter **S** with the middle or meeting of the two curves "of the **S** situate across the shank, the invention also including the inclination of the palms so as that the effect "may be when the shank is pulled to cause one or other of "the palms (with its arm,) whichever may be presented "downwards, to enter the ground and form for itself and "work itself into the ground in an inclined or screw-like path. "If desired to weight the shank at the opposite end, this may "be done either by a cast or wrought-iron boss or appendage."

[Printed, 4*d*. No Drawings.]

A.D. 1866, September 13.—N° 2356.

BETTELEY, JOSEPH HENRY.—Several improvements in anchors are described.

1. The flukes of "solid iron or steel anchors" are made with a "double claw and an elongated shackle for fishing the "anchor." The bill instead of being a single point is double pointed, and the shackle is affixed in the usual way to the crown.

2. In "Trotman's or jointed" anchors, the same "double "claw flukes" are used, and on the shank there is formed a "fish back or raised part projection on the top and bottom" on which the double fluke may rest.

3. In anchors with "double or split shanks" the arms are solid and the flukes have a "double claw." Between the parts of the shanks a cast iron or other metal plate is fixed "forming "fish back or raised part projections on the top and bottom "of the shank" against which the fluke rests.

4. In "jointed anchors when both the double-claw flukes "*are to hold*," "double or short arms" are fixed on the usual

arms, and a "fish back" is formed on each side of the shank against which the short arms may bear and limit the axial movement of the arms. "The double claw flukes" are "much " wider than the upper part of the arms, and for the purpose " of admitting them" the shank has a "double or forked end."

5. The end of the shank is round and fits into a hole in the stock on which it is secured by a pin, &c.

[Printed, 10*d*. Drawing.]

A.D. 1866, September 17.—N° 2379.

JACKSON, James.—The first part of the invention relates to anchors with fixed arms or with arms which have not play enough on the shank to allow the end of the fluke to touch the shank. A chain is carried across from one palm to the other, passing through a hole in the shank, and this chain is sufficiently slack to lie close against one arm when it enters the ground, and be drawn tight across on the other side so as to prevent a cable fouling the upper arm. Instead of passing through a hole in the shank, the chain may be made double, so as to pass on both sides of the shank, and may be held by slotted pieces secured to the shank and fitted over the chain.

The second part of the invention relates to the construction of the "pees and palms of anchors, and the combination " thereof with the flukes. The pees are made of a form taper- " ing or bevilled outwards towards the extremities, and the " palms are likewise tapered or rounded off both towards the " pees and inwards." "Both the pees and palms are combined " with the flukes by welding, rivetting, or otherwise."

[Printed, 10*d*. Drawing.]

A.D. 1866, September 21.—N° 2420.

MORGAN, John Walter.—The anchor described has tumbling flukes which both take the ground at once. The shank is connected to the arms by a "toggle joint." The arms are fixed in a "strap" which has upon it a solid piece, and this piece is jointed to the shank by means of a pair of plates pivotted to it and to the shank. On the upper part of the strap which holds the arms, a pair of horns is fixed. The play of the arms is limited by making the top of the shank and the opposite side of the piece to which it is jointed of such a shape that they bear against one other; or the piece may be formed with projections which rest against the upper part of the shank, and in that case these projections act instead of the horns above mentioned which are dispensed with.

The stock is formed of two plates of iron, united at their ends; these fit over the shank, and the shank has on it two lugs which take into slots in the shank, so that the stock swivels thereon. It is thereby enabled to give way when fouled by a cable.

[Printed, 1*s*. Drawings.]

A.D. 1866, October 5.—Nº 2565.

PIERCE, Denison Chauncey.—(*Provisional protection only.*) —Several improvements in anchors are described :—

1. "The adaptation of a bow or arc of iron formed of two " movable bars. The upper and lower ends of each are " respectively connected" "to the ends of the arms of the " stock and to the crown on either side thereof." For an additional support to the stock two extra bars are used "one " on either side of the shank and reaching upwards to the " point of junction of the first named bars and the ends of " the arms of the stock, at an angle of about 45 degrees."

2. The arms are jointed to the crown by "strong hinges to " the inside thereof, while the lower part is strengthened by " inserting arched bars of iron into the flukes; the said bars " working in openings made in the crown in such a manner " that supposing the anchor to have struck the ground on one " of its palms, the opposite one would at once fall forward " by its own weight, drawing out with it the bar."

3. The crown and arms are hollow; that is, there are openings through these parts "giving the head the appearance of " a framework of iron."

The inventor concludes by saying "in adapting my principle " of the bow to anchors as at present in use I cause the ends " of the bars forming the arc to be attached to the outer edges " of the flukes instead of to the crown."

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 3.—Nº 2859.

BAYLISS, William. — (*Provisional protection only.*) — *The improvements* consist in forming anchors of a solid or

“ hollow or partly solid and partly hollow mould or blank “ cast of homogeneous steel, wholly or in parts.” For “a “ solid anchor with the shank and flukes forming one part” a mould is made by casting of the desired metal, say, homo- “ geneous steel, or what is known as Bessemer's steel, or other “ equivalent homogeneous mixture, the said cast mould being “ of the form and proportions best suited for receiving the “ requisite amount of hammering, tilting, or swaging, not “ only to reduce the said mould to the desired form, but also “ to solidify and import a granular structure to the mass.”

In some instances the shank may be cast “hollow and the “ flukes grooved, in order that by internal pressure or sup- “ port, with the process or processes of tilting, swaging, or “ hammering, separately or combined, the said operations “ shall be rendered more effectual for improving and solidify- “ ing the structure of the metal.”

The improvements also apply to anchors “formed in two “ or more parts, with the flukes united to the shank in any “ suitable way.”

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 10.—N 2938.

CAULKINS, Julius Frank, and ARMSTRONG, William John.—(*Provisional protection only.*)—“ This invention “ consists in connecting the flukes and shanks of an “ anchor to each other in such manner that the flukes “ will be free to move on the shank and have at least three “ bearings or supports thereon when the anchor is in holding “ position under strain. Near the outer end of the shank on “ the vertical sides, that is, vertical when the anchor is in “ holding position, four shoulders are formed, on each side “ two at short distances from each other ; these shoulders may “ either be raised pieces on the shank, or the shank may be “ made thinner in the length between them. The flukes are “ formed or constructed so as to have an elongated opening “ in their length from the concave to the convex surfaces, and “ they are shipped or connected on to the shank between the “ shoulders, the distance of which from the inner to the “ outer ones determines the distance the flukes can move. “ The flukes may either work loosely on the shank or on a “ pin passing through the flukes and shank. In holding

" position the concave and convex surfaces of the flukes bear " respectively on inner and outer shoulders, and that end of " the flukes uppermost for the time being rests against the " then upper side of the shank. When the through pin is " used a portion of the strain might be borne by it; thus pro- " viding a fourth bearing or support for the flukes." The flukes may be made in two pieces and be bolted together after they are placed on the shank. Or they may be made in one piece, and placed on the shank before the outer shoulders are formed.

[Printed, 4*d*. No Drawings.]

APPENDIX.

A.D. 1783, March 22.—N° 1360.

MATTHEWS, George.—"A method of making cast iron maliable, so that it would answer every purpose of wrought iron, never before found out or practised, for making cannon, tiers to wheels, arms to axle-trees, anchors, chains, all kinds of iron mill work, forge hammers, bar and chain shott, and iron rollers, which would be of great public utility."

The above is the full title, and contains the only reference in the Specification to anchors. The whole Specification runs as follows :—

"The different articles laid down in the plan thereof hereunto annexed are made as follows, (that is to say) :—First, you make the patern of the different articles you want to make (if tier you make the circle of the wheel in eight parts), by which the moulds are made to cast the different articles in, in a melted state, from the iron stone or oven, which is the first operation. The different articles are made malliable and tough by being put into close ovens and covered with charcoal, to which you communicate fire and exclude the air, and let it burn for twenty-four hours without interruption, and allow them to remain in the oven until the charcoal is quite burnt out and the oven is perfectly cool, after which they may taken out as malliable and tough as hammered or wrought iron, and the tier may be put upon wheels either with hammered nails or screws, thro' the holes which are cast in the tier."

An anchor is among the articles represented in the drawing.

[Printed, 6*d.* Drawing.]

A.D. 1846, October 22.—N° 11,422.

MACCARTHY, John James Alexander. — "Anchors and fids."

The anchor described has only one arm. It has a "heart-"shaped stock or ring piece of iron" in place of the ordinary stock. This is placed in the same position as the ordinary stock, and is caused to project entirely on the opposite side of the shank to that on which the arm projects, so as to cant the anchor over on to the point of the fluke. The shank and arm appear to be made in one piece, the latter being curved over to the proper inclination. In place of a ring or shackle, there is a hole cut out of the solid at the end of the shank.

[Printed, 1*s.* 4*d.* Drawings. See London Journal (*Newton's*), vol. 31 (*conjoined series*), p. 33; Patent Journal, vol. 2, p. 815; Engineers' and Architects' Journal, vol. 10, p. 179.]

A.D. 1851, November 15.—Nº 13,817.

SISCO, Antoine Dominique.—"Improvements in the manu-"facture of chains, and in combining iron with other metals "applicable to such and other manufactures."

Among other articles anchors may be made of thin plates of metal, "which when put together and temporarily held," are to be "dipped into suitable soldering metal." The method of construction is defined as "lamination combined with soldering "or brazing." From one of the drawings it appears that the anchor is to be formed of a series of plates, each of which passes from the point of one fluke down the arm, along the shank, down the other side of the shank, and along the other arm to its end. The plates are bent over to form a loop at the end of the shank for the stock. The crown is formed of a solid piece with a hole, presumably for a shackle, and having a projecting stem which forms the central portion of the shank.

[Printed, 2*s.* 4*d.* Drawings. See Repertory of Arts, vol. 20 (*enlarged series*), p. 26; Mechanics' Magazine, vol. 56, p. 435; Practical Mechanics' Journal, vol. 4, p. 214; Artizan, vol. 9, p. 263.]

A.D. 1853, July 19.—Nº 1711.

BRIMS, Donald.—"Safety apparatus for the protection and "preservation of life on water."

A boat of peculiar construction, entirely covered in, is described. For use with this boat there is a special anchor. The arms and crown are in one piece, and the crown has a slot in it, in which the end of the shank fits. The shank is kept in its place by a shoulder abutting against the edges of the slot, and by a pin which passes through a hole in the end of the shank projecting beyond the crown. To prevent this pin from slipping, it is formed with a stud which slides down a groove in the hole and holds fast when the pin is turned round. The stock is shown in the drawing as sliding in a hole in the shank, and having one end curved and fitted with a knob, so that it can be turned down alongside of the shank.

[Printed, 1*s*. Drawings.]

A.D. 1864, June 11.—N° 1450.

WALKER, Augustus. — (*Provisional protection only.*) — " Construction of steam and sailing vessels."

The only part of the Provisional Specification relating to the present series runs as follows :—" Circular fluked anchors, " which are attached to cables running out through hawse " holes at the bow, are employed. The anchor being hove " up to the hawse hole in the usual manner, a stopper leading " up from the port hole to the capstan is rove through the " ring, and the anchor drawn back. When the anchor " approaches the anchor port, a block and tackle suspended " from a crane is attached to a small ring in the crown of " the anchor, by which means the latter is raised to a hori" zontal position, and the anchor is then hove inboard by the " stopper attached to the capstan ; when thus hove in, the " circular flukes completely close the port."

[Printed, 4*d*. No Drawings.]

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—— (*Working Men's College, Great Ormond Street*).
Lowestoft (*Library and Reading Room*).
Lye (*Institution*).
Lymington (*Literary Institute*).
Madeley, Shropshire (*Anstice Memorial, Workmen's Club and Institute*).
Maidstone (*St. Paul's Literary Institute*).
—— *Working Men's Club and Institute.*)
Maldon, Essex (*Literary and Mechanics' Institute*).
Manchester (*Ancoats Branch Free Library*).
—— (*Athenæum*).
—— (*Campfield Free Lending Library*).
—— (*Cheetham Branch Library*).
—— (*Chorlton and Ardwick Branch Free Library*).
—— (*Hulme Branch Free Library*).
—— (*Law Library*).
—— (*Mechanics' Institution*).
Manchester (*Natural History Museum, Peter Street*).
—— (*Owen's College*).
—— (*Portico Library, Mosley Street*).
—— (*Rochdale Road Branch Free Library*).
—— (*Royal Exchange Library*).
—— (*Scientific and Mechanical Society*)
Mansfield (*Co-operative Industrial Society*).
—— (*Mechanics', Artizans', and Apprentices' Library*).
—— (*Mechanics' Institute*).
Marlborough (*Reading and Mutual Improvement Society*).
—— (*Working Men's Hall*).
Melksham (*Mutual Improvement Society*).
Melton Mowbray (*Literary Institute*).
Mere, near Bath (*Literary Association*).
Merthyr-Tydfil (*South Wales Institute of Engineers*).
Middlesborough (*Iron and Steel Institute*).
—— (*Mechanics' Institution*).
Middlewich (*Literary and Scientific Institution*).
Modbury (*Mechanics' Institution*).
Mossley (*Mechanics' Institute*).
Needham Market (*Literary Association*).
Newark (*Mechanics' Institute*).
Newbury (*Literary and Scientific Institution*).
Newcastle-upon-Tyne (*Mechanics' Institution*).
—— (*Working Men's Club*).
New Mills, near Stockport (*Mechanics' Institute*).
Newport, Isle of Wight (*Young Men's Society and Reading Room*).
Northampton (*Mechanics' Institute*).
Nottingham (*Free Library*).
—— (*Mechanics' Institution*).
—— (*Subscription Library, Bromley House*).
Odiham (*Mechanics' Institution*).
Oldham (*Analytic Literary Institution*).
—— (*Mechanics' Institution, Werneth*).
Ormskirk (*Public Library*).
Oswestry (*Institute*).
Over, Cheshire (*Working Men's Institute*).
Oxford (*North Oxford Working Men's Club*).
Patricroft (*Mechanics' Institution*).
Pembroke Dock (*Mechanics' Institute*).
Pendleton (*Mechanics' Institution*).
Penryn (*Working Men's Club and Reading Room*).
Perth (*Mechanics' Library, High Street*).

Peterborough (*Mechanics' Institution*).
Plymouth (*Working Men's Institute*).
Poole (*Literary and Scientific Institution*).
—— (*Mechanics' Institute*).
Portsea Island (*Young Men's Christian Association*).
Preston (*Institution for the Diffusion of Knowledge*).
Reigate (*Mechanics' Institution*).
Retford (*Literary and Mutual Improvement Society*).
Richmond (*Working Men's College*).
Rotherham (*Rotherham and Masbro' Literary and Mechanics' Institute*).
Royston (*Institute*).
Ryde, Isle of Wight (*Philosophical and Scientific Society*).
—— (*Young Men's Christian Association and Literary Institute*).
Saffron Walden (*Literary and Scientific Institution*).
St. Just (*Institution*).
St. Leonard's (*Mechanics' Institution*).
Salford (*Working Men's Club*).
Salisbury (*Literary and Scientific Institution*).
Saltaire (*Literary Institute*).
Selby (*Mechanics' Institute*).
Sevenoaks (*Literary and Scientific Institution*).
Shaftesbury (*Literary Institution*).
Sheerness (*Literary Institute*).
Sheffield (*Branch Free Library*).
—— (*Brightside Branch Library*).
—— (*Literary and Philosophical Society, School of Arts*).
—— (*Mechanics' Institution*).
Shepton Mallet (*Reading and Mutual Improvement Society*).
Sidmouth (*Mechanics' Hall*).
Skipton, Yorkshire (*Mechanics' Institute*).
Slough (*Mechanics' Institute*).
Smethwick, Staffordshire (*Library, Reading Room, and Literary Institute*).
Southampton (*Polytechnic Institution*).
—— (*Workmen's Hall*).
Southport (*Athenæum*).
South Shields (*Public Free Library*).
—— (*Working Men's Institute and Club*).
Southwell (*Literary Institution*).
Spalding (*Mechanics' Institute*).
—— (*Christian Young Men's Association*).
Stafford (*Mechanics' Institute*).
Staines (*Literary and Scientific Institution*).
—— (*Mechanics' Institute and Reading Room*).
Stalybridge, Cheshire (*Mechanics' Institution*).
Stamford (*Institution*).
Stourbridge (*Associated Institute*).
—— (*Church of England Association*).
Stourbridge (*Iron Works Reading Room and Library*).
—— (*Mechanics' Institution*).
—— (*Working Men's Institute*).
Stowmarket (*Literary Institution*).
Stratford (*Working Men's Hall*).
Sudbury, Suffolk (*Literary and Mechanics' Institute*).
Sunderland (*Working Men's Club*).
Swansea (*Royal Institution of South Wales*).
—— (*Working Man's Institute*).
Tavistock (*Mechanics' Institute*).
—— (*Public Library*).
Thornton, near Bradford (*Mechanics' Institute*).
Thornton Heath, Croydon (*Workmen's Club*).
Todmorden (*Mechanics' Institution*.)
Truro (*Cornwall County Library*).
—— (*Institution*).
—— (*Royal Institution of Cornwall*).
Tunbridge (*Literary and Scientific Institute*).
—— (*Mechanics' Institute*.)
Tunbridge Wells (*Mechanics' Institution*).
—— (*Society of Literature and Science*).
Turton, near Bolton (*Chapel Town Institute*).
Tynemouth (*Free Public Library*).
Ulverston (*Temperance Hall*).
Uttoxeter (*Mechanics' Literary Institute*).
Uxbridge (*Uxbridge and Hillingdon, Reading and Newsroom Institute*).
Wakefield (*Mechanics' Institute*).
Wallingford (*Free Library and Literary Institute*).
Walsall (*Free Library*).
Walsham-le-Willows, Suffolk (*Institute*).
Ware (*Institute*).
Warminster (*Athenæum*).
Watford (*Literary Institute*).
Wells, Somerset (*Mechanics' Institution, Grove Lane*).
—— (*Young Men's Society*).
Whaleybridge (*Mechanics' Institute*).
Whitby (*Institute*).
—— (*Museum*).
—— (*Subscription Library*).
Whitehaven (*Mechanics' Institute*).
—— (*Working Men's Reading Room*).
Whitstable (*Institute*).
Wilton (*Literary Institute*).
Winchester (*Mechanics' Institution*).
—— (*Training College*).
Wirksworth (*Mechanics' Institution*).
Wisbeach (*Mechanics' Institute*).
Witham (*Literary Institution*).
Witney (*Athenæum*).
Wolverhampton (*Law Library*).
—— (*Library*).
Wolverton (Institute).

Woodbridge (*Literary and Mechanics' Institute*).
———— (*Working Men's Hall*).
Worcester (*Railway Literary Institute*).
———— (*Workman's Hall*).
Yarmouth, Great (*Parochial Library and Museum*).
Yeovil (*Mutual Improvement Society*).
York (*Church Institute*).
—— (*Institute of Popular Science &c.*)
—— (*North Eastern Railway Library and Reading Room.*)

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———— („ „ *Inner Temple*).
———— („ „ *Lincoln's Inn*).
———— („ „ *Middle Temple*)
———— (*Aeronautical Society*).
———— (*Athenæum Club, Pall Mall*).
———— (*British Horological Institute*).
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———— (*Odontological Society*).
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———— (*United Service Museum*).
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———— American Institute, New York.
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———— Mercantile Library Association, Pittsburgh, Pennsylvania.
———— Odd Fellows' Library Association, San Francisco.
———— Smithsonian Institute, Washington.
———— Wabash College, Crawfordsville, Indiana.
———— Young Men's Christian Association, Scranton, Pennsylvania.

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